UNITED STATES DEPARTMENT OF AGRICULTURE

OFFICE OF EXPERIMENT STATIONS

EXPERIMENT STATION RECORD

VOLUME 77

JULY-DECEMBER 1937

COLLEGE AND
17 MAR 193

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON: 1938

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EXPERIMENT STATION RECORD

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THE RETIREMENT OF DIRECTORS LINFIELD AND WILLIAMS

The list of 1937 changes in the leadership of the State experiment stations will soon be further lengthened by the retirement from the directorship of two workers of long service and wide influence. These are Directors F. B. Linfield of Montana and C. G. Williams of Ohio.

Director Linfield, a native of Newfoundland and a graduate of Toronto University, began his work in the United States as professor of animal industry in the Utah Agricultural College in 1893 and 2 years later also became dairyman of the Utah station. In 1902 he went to Montana, originally as professor of agriculture and animal husbandman of the station. He was appointed director in 1904 and has also served as dean of the department of agriculture in the college since 1913.

Thus his service in the mountain region has extended over 44 years, a record well-nigh contemporaneous with agricultural investigation there and for much of the region even with agricultural settlement. He has been closely identified with its development, and he has long been regarded as one of its foremost leaders and as an authority upon matters pertaining to its welfare. Fortunately, although he is relinquishing the leadership of the station on September 1, he will continue to serve as director emeritus in charge of publications so that his experience and wide counsel will still be available. He will be succeeded as dean and director by Vice Dean Clyde McKee, and he, in turn, by A. H. Post, associate agronomist, as head of the department of agronomy.

Director Williams entered the field of experiment station work at the age of 40, but has completed 34 years in the exclusive service of the Ohio Experiment Station. Originally appointed as agronomist and farm superintendent in 1903, he became widely known as an outstanding agronomist and department head and in 1921 was appointed to succeed the late Director Charles E. Thorne in the leadership of the station. In this capacity he has not only maintained the high standards of the institution but has brought about

an increased development in various lines, notably the social sciences and in closer relationships with Ohio State University. In these ways and others he has broadened and strengthened the work of the station and extended its usefulness and influence. He will be succeeded on July 1 by Edmund Secrest, chief of the department of forestry and associate director since 1921.

REGIONAL RESEARCH LABORATORY FOR SWINE IMPROVEMENT

The fourth of the regional research laboratories organized under the Bankhead-Jones Act is now in operation. Known as the Regional Research Laboratory for Improvement of Swine Through the Application of Breeding Methods, it is located at the Iowa State College, where it will serve as the headquarters for the regional program of cooperation between the Federal Department of Agriculture and the experiment stations of the Corn Belt. The unit will be under the supervision of Dr. Hugh C. McPhee, Chief of the Animal Husbandry Division of the U. S. D. A. Bureau of Animal Industry, with Dr. William A. Craft in charge of the Ames Laboratory.

Authorized late in 1936, several projects have now been definitely approved and work is in progress not only in Iowa but also in Missouri and Nebraska. In Iowa the aim is to study various degrees of intensity of inbreeding with the Poland-China, and in Nebraska two types of modified inbreeding with the Duroc-Jersey. Missouri also will investigate modified inbreeding with the Poland-China, with a phase of crossbreeding as a measure of the transmission of characters by the sire.

As in the case of the previously established regional research laboratories (E. S. R., 75, p. 1), these including vegetable breeding in South Carolina, soybeans in Illinois, and grass breeding and pasture improvement in Pennsylvania, rapidity of development is contingent upon a number of factors, not the least of which is the amount of funds which are available. Should the increases contemplated by the Bankhead-Jones Act (E. S. R., 73, p. 289) be forthcoming for the fiscal year 1938, additional expansion and extension to other institutions will doubtless receive early consideration.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A textbook of biochemistry, edited by B. HARROW and C. P. SHERWIN (*Philadelphia and London: W. B. Saunders Co., 1935, pp. 797, figs. 52*).—"Biochemistry . . . has become so encyclopedic in its scope, that it seems an impossible task for any one individual to write an adequate textbook. It is for this reason that we have asked specialists in the various fields of biochemistry to contribute the chapters constituting this book. . . . Three chapters, not usually included in biochemical texts, have been added. The chapter on the cell, it seems to us, is as logical an introduction to biochemistry as a chapter on the atom would be to chemistry. The articles on immunochemistry and the chemistry of bacteria represent new and fertile fields for the expansion of knowledge."

The titles and authors of the 30 chapters of the text proper are as follows: The living cell, by R. Chambers; the carbohydrates, by R. S. Tipson and E. T. Stiller; the neutral fats and related substances, by W. M. Sperry; sterols, bile acids and related compounds, by H. Sobotka; the proteins, by R. H. A. Plimmer; some aspects of the physical chemistry of amino acids and proteins, by C. L. A. Schmidt; the nucleic acids, by R. S. Tipson; nutrition, by E. V. McCollum; the vitamins, by J. C. Drummond; enzymes and digestion, both by I. S. Kleiner; the biochemistry of bacteria, yeasts, and molds, by P. W. Clutterbuck and H. Raistrick; detoxication, by A. M. Ambrose and C. P. Sherwin; immunochemistry, by M. Heidelberger; blood, by J. H. Ferguson; the carriage of the blood gases and the acid-base equilibrium of the blood and respiration and respiratory metabolism, both by H. E. Himwich; animal pigments, by C. S. Leonard; oxidations and reductions, by B. Cohen; carbohydrate metabolism, by C. F. and G. T. Cori; lipid metabolism, by W. R. Bloor; the metabolism of proteins and amino acids, by J. M. Luck; mineral metabolism, by A. T. Shohl; bone and teeth, by J. Knaggs; function of water in the organism, by L. G. Rowntree; the chemistry of muscle, by P. Eggleton; the chemistry of the integument and urine, both by W. Morse; the biochemistry of the brain, by I. H. Page; and hormones, by B. Harrow. A bibliographic index and an index of subjects complete the volume.

The chemistry of milk, W. L. DAVIES (*London: Chapman & Hall, 1936, pp. XII+522, figs. 26*).—"This book . . . is an attempt to gather together in a concise, ordered form, the results of all the relevant and reliable investigation on the chemistry of milk", including that of milk processing, and contains 5 sections and 22 chapters. Part 1, the composition of milk, deals with introductory and general considerations and special variations. Part 2, the constituents of milk, considers milk fat, milk sugar, the protein (casein, lactalbumin, lactoglobulin) and nonprotein nitrogenous constituents, the mineral constituents, the enzymes, and the minor constituents of milk. Part 3 takes up the physical chemistry of milk, including general physical properties, acid-base equilibria, and the coagulation of milk. Part 4 deals with the chemistry of milk processing, the effect of heat on milk, milk and metals, the chemical

technology of milk condensing, and dried milk products. Part 5, the nutritive value of milk, considers the nutritional value of the major constituents of milk, the vitamins, and the nutritive value of milk as a whole.

Fruit jellies.—*IX, The rôle of pectin.—5, The enzymic hydrolysis of starch in the presence of pectin, in pectic extracts, and in apple pomace,* G. L. Baker (*Delaware Sta. Bul. 204 (1936), pp. 89, figs. 15*).—In addition to the information previously obtained in this investigation (E. S. R., 71, p. 293; 76, p. 581), are the following observations:

Enzymic activity upon a substrate at pH 3.5 containing starch and pectin proceeds according to the multimolecular reaction formula. On substrates of pectin only, the enzymic effects of the commercial diastatic preparations are least detrimental at lower pH values. As judged by viscosity measurements, the pectin solutions are more stable in a pH range of from 3.2 to 3.8. Excessive amounts of enzyme preparation added to pectin solutions cause depolymerization and decomposition to simpler substances soluble in alcohol.

"Diastatic hydrolysis of apple starch in pectic extracts should be carried to a point where a brown starch-iodine test is obtained in order to remove the possibility of cloudiness in jelly products due to starch. . . . Heating dried apple pomace in water solution at 80° C. renders the apple starch present hydrolyzable by the diastatic enzyme preparations. Hydrolysis by diastatic enzyme preparations of the apple starch in dried pomace previous to extraction of pectin gives clear pectic liquors of low starch content without loss of jelly units. Small amounts of starch are removed, and increasing clarity is obtained, by extracting pectin at a low pH and allowing the extracts to stand at the extraction pH. Concentrations of pectin as well as apple starch in pectic extracts affect solution clarity. Hydrolysis of starch in pomace simplifies processing of extracted liquor. The adjustment of pH for enzymic treatment, the enzymic treatment, the usual inactivating procedure, and one filtration operation are no longer necessary.

"Freshly pressed pomace was leached with hot water and the apple starch hydrolyzed by enzymic treatment. The resulting dried product gave extracts twice as clear and containing less than 10 percent as much starch in solution as extracts from untreated pomace. No loss of jelly units results from the enzymic removal of starch in this manner."

The gum from lemon trees, E. Anderson, F. H. Russell, and L. W. Seigle (*Jour. Biol. Chem., 113 (1936), No. 3, pp. 683–690*).—This is a joint contribution from the Carnegie Institution of Washington, Stanford University, and the University of Arizona. The work forms part of a more general inquiry into the nature of the polyuronides of lemon wood.

The gum dealt with in the present paper is a pathological product, and is "a brownish-yellow translucent solid which can be ground to a powder. It has a faint odor but is almost tasteless. It dissolves in 3 parts of cold water to form a viscous solution. When very concentrated solutions of the gum are heated, they often form a semisolid gel. The gum does not reduce Fehling's solution until after it has been hydrolyzed by hot dilute acids. It consists of a uronic acid to which is attached an ether-linked methoxyl group. The aldehyde group of the uronic acid is attached by a glucosidic linkage to a series of molecules of *d*-galactose. The latter are attached by glucosidic linkages to a series of molecules of *l*-arabinose. The composition of the purified gum corresponds to 1 molecule of a methylated uronic acid plus 2 molecules of *d*-galactose plus 2 molecules of *l*-arabinose minus 5 molecules of water. Since, however, salts were obtained in which 1 molecule of a methylated uronic acid is combined, respectively, with 1, 2, 3, and 4 molecules of *d*-galactose, it appears that this simple formula must be doubled. This would indicate that

the gum consists of 2 molecules of a methylated uronic acid plus 4 molecules of *d*-galactose plus 4 molecules of *l*-arabinose minus 10 molecules of water."

The chemistry of lignin.—X, Lignin from oat straw, M. PHILLIPS and M. J. GOSS (*Jour. Biol. Chem., 114 (1936), No. 2, pp. 557-565*).—In an investigation carried out at the U. S. D. A. Bureau of Chemistry and Soils, three lignin fractions were isolated from oat straw by extracting it successively and exhaustively, first with a 2-percent alcoholic sodium hydroxide solution at room temperature, then (under reflux) with a 4-percent aqueous sodium hydroxide solution, and finally with fuming hydrochloric acid.

"The composition of the first lignin fraction agreed with that represented by the formula $C_{40}H_{46}O_{16}$. Four methoxyl groups and four hydroxyl groups were found to be present. Of the four hydroxyl groups, two could be methylated with diazomethane, thus indicating that these are more acidic, possibly phenolic or enolic in character. When fused with potassium hydroxide, protocatechuic acid was obtained. The yield was approximately 4 percent of the weight of the lignin. The analytical results on the second lignin fraction are more in agreement with that represented by the formula $C_{40}H_{42}O_{16}$. In this lignin fraction, approximately four methoxyl groups and four hydroxyl groups were shown to be present. Two of the hydroxyl groups could be methylated with diazomethane. The third lignin fraction was found to have a higher percentage of carbon than either of the other two lignin fractions. The percentage of methoxyl did not differ from that of the other two fractions. The alkoxyl groups present in all the three lignin fractions were proved definitely to be methoxyls. All the three fractions when distilled with 12 percent hydrochloric acid afforded some formaldehyde. The lignin fractions isolated from oat straw are closely related to the corresponding lignin fractions isolated from barley straw."

Chemical nature of the vitamins, W. C. RUSSELL (*Sigma Xi Quart., 24 (1936) No. 1, pp. 6-8*).—This contribution from the New Jersey Experiment Stations consists of a brief review of the literature dealing with the establishment of the chemical nature of vitamins, C, B_1, A, and D. Graphic structural formulas of these and of lactoflavine are presented.

Evidence concerning two types of plant diastase, G. L. TELLER (*Jour. Biol. Chem., 114 (1936), No. 2, pp. 425-430, figs. 3*).—Germinating barley, rye, and wheat, and certain other plant products are shown to contain two types of sugar-forming diastase. These have different activities in starch media of different pH and at different temperatures. Where both diastases are present the amount of maltose produced at any one point as located by pH and temperature is a resultant of the combined action of the two. The divergence between the results of the two diastases acting in media of different pH is much greater at the higher temperatures of diastatic activities than at the lower.

"At 60° [C.] the difference is such that when the maltose produced by the one diastase in an acid starch paste of pH near 4.5 is divided by the maltose produced in equal time in less acid starch paste, pH near 6.2, the ratio will be materially greater than 1. This is the type characteristic of normal wheat flour and some other but not all reserve substances. It is here called reserve diastase. With the other diastase acting under like conditions, the ratio will be materially less than 1. This is the type developed during germination. It predominates in the bran of germinating cereals and in general in those plant parts most closely associated with active vegetation. It is here called vegetative diastase."

The selective adsorption of enzymes by cellulose, H. TAUBER (*Jour. Biol. Chem., 113 (1936), No. 3, pp. 753-757*).—The author reports experiments from which he concludes that "cotton exerts selective adsorption toward enzymes.

Its practical application is obvious, since no contamination of the enzyme material occurs, such as takes place with other adsorbents (inorganic gels, tannin, etc.). The use of cotton for filtration of enzyme solutions is therefore impractical, since much of the active enzyme is adsorbed. Cotton should not be used for the filtration of gastric or intestinal juices if enzyme activity is to be determined. If a centrifuge is not available, glass wool or open texture 'fact' filter paper should be used.

"Adsorption by cotton may prove useful in the selective concentration of enzymes and in testing the purity of crystalline enzymes."

The recovery of hydrocyanic acid from fumigated citrus leaves, E .T. Bartholomew and E. C. Raby (*Jour. Biol. Chem., 113 (1936), No. 3, pp. 655–660*).—At the California Citrus Experiment Station a photoelectric turbidimeter, specially devised and constructed for the purpose, proved to be very satisfactory for determining hydrocyanic acid in solutions.

"Evidence is presented which indicates that at least a portion of the HCN which enters the living citrus leaves during fumigation is quite rapidly and permanently fixed. Hydrocyanic acid could not be recovered from fumigated citrus leaves by the acid distillation method because it combined with some substance or substances in the distillate. Much more HCN than the leaves would be expected to absorb during the fumigation period had to be added before any could be detected in the distillate. The evidence is not yet complete, but it does not appear that the aldehydes, sugars, or citral were entirely responsible for the disappearance of such large quantities of HCN."

The physiology of Rhizopus oryzae, L. B. Lockwood, G. E. Ward, and O. E. May (*Jour. Agr. Res. [U. S.], 53 (1936), No. 11, pp. 849–857*).—The authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils investigated the physiology of the organism in question primarily from the point of view of its capacity to produce *d*-lactic and fumaric acids.

Though a temperature of 40° C. was more favorable for growth and glucose consumption than was that of 30°, the higher temperature was less favorable for *d*-lactic acid production. "The period of greatest activity in *d*-lactic acid production immediately preceded sporulation. The glucose concentration most favorable for the production of *d*-lactic acid was approximately 15 percent. Slightly greater yields of *d*-lactic acid were obtained when the KH_2PO_4 concentration was 0.6 or 1.2 g per liter than when the concentrations were lower.

"Fumaric acid production was suppressed in cultures containing more than 6 g of NH_4NO_3 per liter. A wide range of NH_4NO_3 concentration, 1.5 to 6 g per liter, was favorable for *d*-lactic acid production.

"*R. oryzae* readily utilized NH_4NO_3, $(NH_4)_2SO_4$, NH_4Cl, urea, *d*-, *l*-alanine, *d*-glutamic acid, glycine, and peptone as nitrogen sources. $NaNO_3$ was an unsatisfactory nitrogen source, and when $NaNO_3$ was supplied as the sole source of nitrogen no growth occurred. In the presence of $CaCO_3$, $ZnSO_4$ exerted an influence on the metabolism of *R. oryzae*, the greatest quantity of *d*-lactic acid being produced at the concentration of 10 mg per liter of zinc. Under favorable conditions of nitrogen metabolism, the formation of fumaric acid depended on the maturity of the mycelium."

Semi-micro-Cottrell boiling point apparatus, M. L. Willard and D. E. Crabtree (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 1, pp. 79, 80, fig. 1*).—An apparatus of the type named—the principle being that of the bubbling of the liquid and its vapor in equilibrium over either a thermometer bulb or a thermocouple—was redesigned at the Pennsylvania State College for construction in a size about one-tenth of that ordinarily used, and this smaller form of the apparatus was shown to give satisfactory results.

"With an apparatus of 5-cc capacity boiling points were found which were accurate to 0.1° C. The mean deviation for the liquids tried was 0.02°. Starting with 5 cc of pure material, a take-off of 60 percent may be made without causing any variation in the millivolt reading obtained."

A new electrophoresis cell for microscopic observations, M. E. Smith and M. W. Lisse (*Jour. Phys. Chem., 40 (1936), No. 3, pp. 399–412, fig. 1; abs. in Pennsylvania Sta. Bul. 336 (1936), p. 15*).—A new type of cell (double tube) is described, and its theory and theoretical advantages are discussed, together with the results of an experimental comparison with the usual type of cell. Values of electrophoretic mobilities of finely ground quartz particles in triply distilled water obtained in the new double-tube cell agreed within the experimental error with values as determined in a single cylindrical tube. In both cases observations were made at depths where, theoretically, there should be no movement of the liquid. The consistency of the results secured with the new cell indicated a part of its advantages.

The development of quantitative spectrographic methods for agricultural research, L. W. Gaddum, R. C. Williamson, and L. H. Rogers (*Florida Sta. Rpt. 1936, pp. 97, 98*).—Methods for the determination of copper and zinc are noted.

Copper catalysis of the oxidation of thiol acids as a basis for the microdetermination of copper, J. Bjerrum (*Jour. Biol. Chem., 114 (1936), No. 2, pp. 357–359*).—Comparing the oxidation of cysteine, in the presence of minute quantities of copper, with that of other thiol acids, the author has shown that "thiol acids such as thioglycolic, thiolactic, and thiomaleic acids (contrary to cysteine) were oxidized by air in 0.1 to 1 N hydrochloric acid solution in the presence of traces of copper. The oxidation of both thioglycolic and thiolactic acids to the disulfide acids could be followed by a simple iodine titration, but thiomaleic acid, like cysteine, was oxidized beyond the disulfide stage." The author studied this reaction with a view to the determination of minute quantities of copper compounds and was able to elaborate "a simple iodometric method for the estimation of small amounts of copper of the order of 10^{-4} mg. The method requires neither special apparatus nor the use of the more expensive cysteine." The results obtained are shown to agree well with those given by methods involving cysteine oxidation.

A study of the several Minnesota reagents for the determination of fat in buttermilk, E. W. Bird and D. F. Breazeale (*Jour. Dairy Sci., 20 (1937), No. 1, pp. 1–7, fig. 1*).—Tests conducted at the Iowa Experiment Station showed that different values for the fat content of a single sample of buttermilk were obtained with each of the three Minnesota reagents that have been proposed. The average of 12 tests on a single sample of buttermilk with each of the Minnesota reagents designated as A, B, and C (sold commercially), the American Association, the Babcock, and the Mojonnier methods were 0.512, 0.465, 0.198, 0.739, 0.233, and 0.745 percent, respectively.

Saponification occurred with all three Minnesota reagents during the digestion period, the estimated amounts being 5.17, 8.62, and 16.73 percent for reagents A, B, and C, respectively. Approximately 30 percent of the difference between the readings obtained with reagents A and C was due to saponification, the other 70 percent being ascribed to differences in manipulative procedure.

Rapid determination of oil content and oil quality in flaxseed, L. Zeleny and D. A. Coleman (*U. S. Dept. Agr., Tech. Bul. 554 (1937), pp. 46, figs. 9*).—Finding available methods for the determination of the oil content of flaxseed and of the quality of the oil to be too slow for commercial inspection work,

the authors have developed and tested more rapid methods of considerable accuracy.

Following a study of the principal sources of error in the ether-extraction method, "an extraction procedure has been developed which eliminates these errors to a large degree and which serves as a standard check method for use in the development of more rapid methods. A centrifugal method for the rapid determination of oil content has commercial possibilities under conditions where an accuracy of ±1-percent oil is sufficient. The method is very simple in operation and requires relatively simple equipment. Approximately eight determinations may be made in an hour, by one analyst. The method is not recommended when a high degree of accuracy is required."

The refractometric method originally proposed by Coleman and Fellows (E. S. R., 67, p. 505) has been perfected to eliminate its chief source of error and so simplified that "the average analyst may quickly master the technic. A high degree of accuracy may be attained by the modified method, as evidenced by the fact that in the analysis of 84 samples of flaxseed, covering a wide variety of types, by both the refractometric method and the petroleum-ether extraction method, a correlation coefficient of +0.993 was obtained with a standard error of prediction of ±0.26 percent of oil for the modified refractometric method. Results obtained by collaborative study show a greater degree of accuracy and reliability for the modified refractometric method than for the standard petroleum-ether extraction method. A single analysis by the modified refractometric method can be made in about 30 min., as compared with the 16 to 24 hr. generally required for the extraction method. Approximately 100 analyses may be made in an 8-hr. day with a single set of equipment by one analyst with the aid of two nontechnical assistants.

"The refractive index of flaxseed oil prepared by special methods may be used as a direct measure of iodine number, the latter value being now used commercially as an approximate measure of the drying quality of the oil. In the analysis of oils from 96 samples of flaxseed, with iodine numbers (Wijs) ranging from 155 to 197, a correlation coefficient of +0.9965 between iodine number and refractive index was found, with a standard error of prediction of iodine number of ±0.82. When the oil content has been determined by the proposed refractometric method, no additional labor is involved in determining the iodine number refractometrically."

A potentiometric adaptation of the Shaffer-Hartmann sugar method, L. F. Ney and E. S. West (*Jour. Biol. Chem., 114 (1936), No. 2, pp. 547–550*).—This potentiometric adaptation of this method (E. S. R., 45, p. 111) has been found applicable to pure sugar solutions, iron and zinc filtrates of blood, and ferric sulfate-Lloyd's reagent filtrates of urine.

Prevention of foaming in crude-fiber determinations, H. W. Gerritz (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 1, p. 75, fig. 1*).—"The custom of breaking the foam by blowing through an auxiliary tube or through the condenser requires the constant attention of the analyst. The author has found that a fine jet of air projected on the center of the boiling liquid is as effective in dispersing the foam as a larger current of air. Furthermore, if proper precautions are taken, a fine jet of air may be projected on the surface of the digesting material throughout the digestion period without increasing evaporation." The author's apparatus, devised at the Washington Experiment Station, consisted of capillary jets inserted through the condenser tubes into each flask of a battery of six, all of the jets being connected through a common supply tube to a source of compressed air.

A modified method for the study of tissue oxidations, V. R. POTTER and C. A. ELVEHJEM (*Jour. Biol. Chem., 114 (1936), No. 2, pp. 495–504, figs. 3*).—The authors of this contribution from the Wisconsin Experiment Station describe a new method for the study of tissue respiration in which the tissues are homogenized in a buffer medium by a high speed glass pestle and studied at various dilutions by means of the Barcraft respirometer. The "dilution effect" (the lowering of the oxygen quotient) which occurs when tissue suspensions are diluted is shown in the base of rat liver and brain and chick liver and kidney; the applicability of the method to the study of succinoxidase is shown; and the possibility of studying other oxidizing systems by adding appropriate coenzymes to tissue suspensions is discussed.

The determination of total base in blood and other biological fluids by the electrodialysis method of Adair and Keys, A. KEYS (*Jour. Biol. Chem., 114 (1936), No. 2, pp. 449–459, figs. 3*).—The essential feature of this method[1] is that base ions are electrodialyzed from the solution being analyzed across a collodion or cellophane membrane to negatively charged mercury above which stands a known amount of standard acid. When the dialysis is complete, the circuit is broken, the base-mercury amalgam is decomposed by shaking with the acid, and the excess acid is titrated without removing it from the vessel.

As adapted for the purpose here dealt with, the method "gives results accurate to within 1 percent when samples of 0.2 cc of biological fluids are used. By this method at least twenty-four determinations may be made within the course of the day."

Determination of chlorides in biological fluids by the use of adsorption indicators: The use of diphenylamine blue for the volumetric microdetermination of chlorides in urine and blood filtrates, A. SAIFER and M. KORNBLUM (*Jour. Biol. Chem., 114 (1936), No. 2, pp. 551–555*).—The authors describe a rapid, accurate method for the determination of chlorides in blood filtrates and urine by direct titration with silver nitrate, in which diphenylamine blue is used as an adsorption indicator. "Quantities in the range of 1 mg of sodium chloride can be determined with a maximum deviation of 2 percent."

A study of the estimation of sodium in blood serum, E. G. BALL and J. F. SADUSK, JR. (*Jour. Biol. Chem., 113 (1936), No. 3, pp. 661–674*).—The authors have devised, at The Johns Hopkins University, a volumetric procedure for the determination of sodium in as little as 0.2 ml of serum. The method is based on the precipitation of sodium as uranyl zinc sodium acetate, the reduction of the uranium in the precipitate to the quadrivalent state, and its subsequent quantitative oxidation with dichromate to the hexavalent condition.

"Serum ash or filtrate may be employed, though results with the latter give values 1 to 3 percent too high, an effect ascribed to a volume displacement by the precipitated protein. Results on ashed samples agreed within 1 percent with those found by the macrochloroplatinate procedure. The gravimetric uranium and pyroantimonate methods were also employed for the sake of comparison and found to be entirely reliable."

The ionization constants of calcium proteinate determined by the solubility of calcium carbonate, E. G. WEIR and A. B. HASTINGS (*Jour. Biol. Chem., 114 (1936), No. 2, pp. 397–406*).—Determinations of the solubility of calcium carbonate in solutions of casein, serum albumin, and serum globulin were made at 38° C. for several pH values and protein concentrations. From these data, the ionization constants of the calcium salts of these proteins were calculated.

[1] Jour. Physiol., 81 (1934) No. 2, pp. 162–166, fig. 1.

They were found to have the following values: Casein, $pK_{CaProt}=2.23$; globulin, $pK_{CaProt}=2.32$; albumin, $pK_{CaProt}=2.20$. The experimental methods used and the bases of the calculations made are detailed.

Some applications of a new color reaction for creatinine, S. R. BENEDICT and J. A. BEHRE (*Jour. Biol. Chem., 114 (1936), No. 2, pp. 515–532, figs. 2*).—A new color reaction for creatinine with 3,5-dinitrobenzoic acid in presence of alkali is described. Results obtained by the application of this reaction to various creatinine derivatives, to glycocyamidine and hydantoin, and to urine and blood filtrates are recorded. A method for the determination of urinary creatinine by the new reagent is detailed.

"Determinations made upon human urine samples from which creatinine has been removed by Lloyd's reagent indicate that figures for urinary creatinine by the picrate methods are from 2.5 to 5 percent too high. Human blood filtrates yield with the dinitrobenzoic acid method a color so different, both in shade and stability, from that given by creatinine that the chromogenic substance in such filtrates cannot be determined as creatinine." The significance of these results in relation to the question of the creatinine chromogenic material of blood is discussed, the findings being interpreted as furnishing further evidence in favor of the view that this chromogenic material is not creatinine.

An examination of the Sullivan colorimetric test for guanidine, C. E. BRAUN and F. M. REES (*Jour. Biol. Chem., 114 (1936), No. 2, pp. 415–417*).—The authors of this contribution from the University of Vermont, having available a number of new mono- and diguanidine derivatives, subjected the specificity of the test named to a critical study. They find that in view of the "observations made on 36 different guanidine derivatives, not including various salts of the same base, it must be concluded that the Sullivan colorimetric test for the detection of free guanidine is not as highly specific as was first thought, since the reaction is positive with certain substituted guanidines. However, in consideration of the fact that the interfering guanidine structures mentioned above normally would not be expected to be found in biological fluids, the specificity and value of the Sullivan test in clinical investigations still remain."

Ascorbic acid oxidase in determining vitamin C in lens and aqueous humor, L. ROSNER and J. BELLOWS (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 4, pp. 493, 494*).—The vitamin C content of the lens was determined by two extractions with 5 percent metaphosphoric acid, centrifuged, washed, and made up to a volume of 50 cc. A 1-cc aliquot was treated with 2,6-dichlorophenolindophenol, and another 1-cc aliquot was incubated for 30 min. at pH 5.5 with 1 cc of enzyme extract. The solution was brought to pH 2 with sulfuric acid and titrated. Similar experiments were made upon the aqueous humor. The results indicate that at pH 2 the total reducing action of the lens and aqueous humor on Tillman's reagent is due to the vitamin C content.

AGRICULTURAL METEOROLOGY

Monthly Weather Review, [November–December 1936] (*U. S. Mo. Weather Rev., 64 (1936), Nos. 11, pp. 351–395, pls. 10, figs. 24; 12, pp. 397–448, pls. 12, figs. 28*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 11.—Structure and Maintenance of Dry-Type Moisture Discontinuities Not Developed by Subsidence, by J. Namias (pp. 351–358); Long-Period Weather Changes and Methods of Forecasting, by H. H. Clayton (pp. 359–376) (see

p. 12); *Corrections to Atmospheric Turbidity and Water Vapor Values as Computed from Solar Radiation Intensity Measurements at the Blue Hill Meteorological Observatory of Harvard University During 1936*, by H. H. Kimball (p. 377); and Notes and Reviews: Introduction to the Study of Air Mass Analysis, by J. Namias (pp. 377, 378).

No. 12.—Energy of Conditional Instability, by W. Littwin (pp. 397–400); Synoptic Determination and Forecasting Significance of Cold Fronts Aloft, by B. Holzman (pp. 400–414); Upper-Air Cold Fronts in North America, by S. Lichtblau (pp. 414–425); Preliminary Report on Tornadoes in the United States During 1936, by J. P. Kohler (pp. 426, 427); Tropical Disturbances of 1936, by I. R. Tannehill (pp. 427, 428); Extratropical Disturbances in Low Latitudes of Mid-Atlantic, December 1936, by J. H. Gallenne (p. 428); Duststorms of August–December 1936 in the United States, by R. J. Martin (p. 429); and On the Computation of Atmospheric Turbidity and Water Vapor from Solar Radiation Measurements—A Correction to Previous Note, by H. H. Kimball (p. 430).

Measurement of precipitation, B. C. Kadel (*U. S. Dept. Agr., Weather Bur. Circ. E, 4. ed., rev. (1936), pp. [1]+25, figs. 13*).—The instructions given (E. S. R., 47, p. 810) are revised to 1936.

The human side of snow, J. E. Church (*Sci. Mo., 44 (1937), No. 2, pp. 137–149, figs. 16*).—This article tells the story of the Mount Rose observatory overlooking Lake Tahoe, Nev., at an elevation of 10,800 ft., and of the development of a world-wide system of snow measurement as a basis for forecasting water supply from this source for irrigation, power, and other useful purposes. It shows how, "in the space of less than half a century, a trip made solely in love of winter nature has given birth to snow surveying and to a world organization whose central purpose is to study the scientific and human aspects of snow and ice, now designated as a new field in hydrology and by some as a new science with the forbidding name of cryology (the science of cold)." The basic study has been a research project of the Nevada Experiment Station for many years.

Conference on atmospheric ozone held at Oxford, September 9th to 11th, 1936 (*Quart. Jour. Roy. Met. Soc. [London], 62 (1936), Sup., pp. IV+76, figs. 14*).—Papers presented and discussed at this conference dealt with methods of measurement of ozone, vertical distribution of ozone, absorption of radiation and temperature of the upper atmosphere, horizontal distribution of ozone and weather conditions, and miscellaneous subjects.

A paper on Variations in Atmospheric Ozone and Weather Conditions, by G. M. B. Dobson (pp. 52–54) states that "one of the most interesting results that has come out of the study of the amount of ozone in the atmosphere is the relation which is found between the amount of ozone and the weather conditions", but that unfortunately little progress has recently been made in the study of this subject. "At the present time we know that large changes in the amount of ozone may take place within a few days—changes of the order of ±25 percent—and these changes are closely associated with changes in the weather conditions. Around a cyclonic depression the amount of ozone is nearly everywhere above the average, and it is particularly high just to the west of the center of low pressure. . . . It is also of great interest to find that the ozone content of the atmosphere is very closely related to several meteorological characteristics of the upper atmosphere. . . . The possible aid which ozone observations might give to weather forecasting makes it very desirable that the subject should be thoroughly explored."

Is our climate changing? J. B. Kincer (*Sci. Digest, 1 (1937), No. 1, pp. 39–41*).—From a study of the evidence for and against significant changes in

climate, with particular reference to droughts, the author concludes that "our longest records indicate that there has been no permanent change in climate, but rather we are going through a dry phase of our normal climate, of which the present family of droughts is a part."

Long-period weather changes and methods of forecasting, H. H. CLAYTON (*U. S. Mo. Weather Rev., 64 (1936), No. 11, pp. 359–376, figs. 21*).—The development of the author's system of long-period forecasting, based upon his belief that variations in weekly, monthly, or annual means of pressure are "the results of large atmospheric movements of orderly procedure, and hence predictable when understood," is explained. The essentials of the system are briefly stated as follows: "(1) The analysis of weather phenomena into pulses, waves, or periods of different length; this is done for each station in a network of stations, and the latest values plotted on maps. From a succession of such maps the movements of areas of excess and deficiency can be followed and their future position anticipated; (2) correlation of the meteorological pulses or waves with solar radiation pulses or waves found in the same way; (3) projection of these waves ahead into the future, using for this purpose the mean lengths of the solar periods determined by experience or calculation; (4) reading from each of the curves so projected ahead the value for some particular time or epoch desired, and summing the different values thus obtained; (5) the process described in (3) is done for a network of stations, the sums are plotted on maps and lines of equal value drawn. These maps then become a forecast for the area covered."

Methods of seasonal weather forecasting in California, G. F. MCEWEN (*Citrus Leaves, 17 (1936), No. 12, pp. 22, 26*).—It is stated that "evidence is accumulating in support of a correlation between the general trend of sea temperatures and atmospheric temperatures and between each of these and the general trend of precipitation in this Pacific coastal region. In particular, the gradient between winter and late fall sea surface temperatures appears to be an important advance index of precipitation." Using such correlations the Scripps Institution of Oceanography, in June 1936, issued the following predictions of air temperature trends in southern California, which it is stated have been well verified to date: "San Diego, 1° above from June to September; Santa Ana, about average from June to September; Riverside, irregularly 1° to 3° above from June to September, greatest excess in August."

[Meteorological and crop protection service], E. S. ELLISON (*Florida Sta. Rpt. 1936, pp. [4], 99–106, 115–117, 142, figs. 4*).—This includes the first year's report of work of the activities of the Federal-State Horticultural Protection Service in Florida, which was established in cooperation with the station and the U. S. Weather Bureau with a Federal appropriation of $15,000 and a State appropriation of $10,000 annually, primarily to reduce losses caused by frost and freezes. The essential features are a temperature survey based on observing stations well distributed throughout the State and a forecast and frost warning service. Some cooperative experiments in frost protection for tomatoes, peppers, and eggplants in areas where these are major crops are reported. The station continued its usual observations in the Everglades and at Quincy on temperature, rainfall, and evaporation, and studied the relation of wind velocity to barometric pressure.

SOILS—FERTILIZERS

[Soil and fertilizer studies by the Florida Station] (*Florida Sta. Rpt. 1936, pp. 59, 60, 61, 124, 125, 127, 128, 137, 138*).—Notes are given on the determination of the effect of green manures on the composition of the soil and the occurrence

and behavior of zinc in soils, both by R. M. Barnette; saline soil studies, oxidation of sawgrass peat as related to its conservation, physical changes in peat and muck, green manure experiments, nitrate accumulation, soil reaction, and studies upon the role of zinc and other special elements in plant development upon the peat and muck soils of the Everglades, all by J. R. Neller and R. E. Robertson; and on root environment in sawgrass peat, nature of subsurface waters, and the need for phosphorus, by Neller.

[Soil investigations of the Oklahoma Station] (*Oklahoma Sta.* [*Bien.*] *Rpt. 1935–36, pp. 98–103, figs. 2*).—The report contains brief discussions on the soil survey as the basis of economic land use, importance of lime in Oklahoma, and cropping systems for the maintenance of the organic matter and nitrogen content of Oklahoma soils, all by H. J. Harper.

[Soil and fertilizer investigations by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 336* (*1936*), *pp. 21, 22, 23*).—Notes are presented on the relative value of limestone of various degrees of fineness, by J. W. White and F. J. Holben; and on lime and fertilizer for Volusia soils, by White, Holben, and Jeffries.

[Soil and fertilizer investigations of the Utah Station] (*Utah Sta. Bul. 276* (*1936*), *pp. 35–45, figs. 7*).—This station summarizes recent work under the following captions: Fine-textured soils of the Delta area make diversified farming difficult, soil surveys of the State are resumed, and study made of soil productivity in regard to land and water use, all by D. S. Jennings; what is responsible for loss of nitrogen and organic matter in dry-land soils, by J. E. Greaves and A. F. Bracken; determine friability of soils, by Jennings et al.; strawberry clover shows promise for western alkali lands, by R. J. Evans and D. W. Pittman; what is the proper treatment of alkali land, summarize results of cropping and manuring systems on soil productivity, and statewide commercial fertilizer tests show interesting results, all by Pittman; trials at Sanpete County Farm indicate best practices for peat soils, by L. Wilson; Carbon County soils subject to erosion, by I. D. Zobell; commercial fertilizers prove highly beneficial in irrigated pasture studies, by G. Q. Bateman, Evans, and Pittman; benefits of commercial fertilizers to soil fertility summarized, by Greaves, Jennings, and Pittman; orchard soils analyzed for arsenic content and alfalfa changes nitrogen-fixing properties of soil, both by Greaves and K. R. Stevens; and Greenville Farm soil has abundance of nitrogen, by Greaves and C. T. Hirst.

Soils of Teton County: Soil reconnoissance of Montana—Preliminary report, L. F. Gieseker (*Montana Sta. Bul. 332* (*1937*), *pp. 63, fig. 1, maps 4*).—Teton County covers an area of 2,295 sq. miles in northwestern Montana. Its present boundaries enclose a fairly compact agricultural area, in which some of the more important dry and irrigated lands in the State are located. The present preliminary survey indicated 21 series of 41 types, the area mapped as Bainville loams, 10.1 percent of the total area of the county, being the largest area designated as of a single type. Mountains occupy 19.7 percent.

Soil survey of Broome County, New York, C. Lounsbury et al. (*U. S. Dept. Agr., Bur. Chem. and Soils* [*Soil Survey Rpt.*], *Ser. 1932, No. 11, pp. 40, pls. 2, figs. 2, map 1*).—Broome County occupies 451,200 acres of a plateau dissected by natural drainageways in the southern part of New York State. The topography of the county is characterized by "well-rounded valley slopes and rather narrow ridge tops, the result of the action of glaciers."

According to this survey, made in cooperation with the [New York] Cornell Experiment Station, the Canfield and Lordstown gravelly silt loams and Volusia silt loam are among the more extensively developed soils, constituting,

respectively, 20.9, 19.5, and 19.2 percent of the area surveyed. There were found altogether 19 soil series, inclusive of 28 types. These types are classified according to their productivity for various crops.

Soils of Collin, Frio, Galveston, Midland, Potter, and Van Zandt Counties and the Trans-Pecos area, G. S. Fraps and J. F. Fudge (*Texas Sta. Bul. 533 (1936), pp. 54*).—*Supplementing U. S. D. A. Soil Surveys* (E. S. R., 70, pp. 158, 448; 71, p. 750; 73 p. 14; 74, p. 10), chemical analyses and results of pot experiments on samples of typical soils from six counties and the Trans-Pecos region are presented, together with condensed descriptions of the soil series. A new classification of constituents, five classes based upon chemical composition, is proposed, and its relation to previous methods of interpretation is discussed.

"Most of the soils are low (classes 4 and 5) in nitrogen and phosphoric acid. They are better supplied (classes 2 and 3) with potash. Some of the soils are low in lime and basicity (classes 4 and 5), while others are basic and even highly calcareous (class 1). Some of the soils are slightly acid, but most of them are neutral to alkaline."

Peat land in the Pacific Coast States in relation to land and water resources, A. P. Dachnowski-Stokes (*U. S. Dept. Agr., Misc. Pub. 248 (1936), pp. 68, pls. 3, figs. 3*).—A study has been made of various peat areas in California, Oregon, Washington, and northern Idaho. Information is given in detail concerning the genesis and intrinsic physical characteristics of peat profiles, the relation of their composition to the present cover of vegetation and to historical ecologic antecedents, the modifying conditions that determine the development of organic soils and their general productivity for crops, the uses of peat resources in connection with the commercial production of peat and muck as organic matter for soil improvement, and the conservation of surface waters and ground-water supplies.

"From the information at hand it appears that heavy losses and deterioration of peat land have been caused in recent years, notably in the Klamath Basin and in the southern Pacific section, by excessive drainage, the spreading injury by 'alkali' and salt accumulation, damage from fires, wind erosion, and reclamation of peat land of doubtful agricultural value.

"To forestall a critical water shortage in the coastal States and to increase water supplies, the restoration of water levels and original cover of vegetation or an approximation to it would prove an invaluable step. . . . To bring more peat land under cultivation appears to be undesirable under present economic and critical ground-water conditions. These hazards in the West must bring some consideration of the necessity of withdrawing areas of peat land from unsuitable agricultural and industrial uses, and allowing them to produce a type of native vegetation that would offer a barrier to floodwaters and silting, absorb rainfall, impound water supplies, and increase the water content of the ground by percolation."

Trace elements in the soils from the erosion experiment stations, with supplementary data on other soils, C. S. Slater, R. S. Holmes, and H. G. Byers (*U. S. Dept. Agr., Tech. Bul. 552 (1937), pp. 24*).—Analytical methods have been adapted to the determination of certain elements when present in soils in quantities which are best expressed in parts per million. Data to show the degree of accuracy of the results obtained are given. Eleven profiles of soil types from 10 of the erosion experiment station soils, representing 4 of the great soil groups, were examined, together with 3 other soil types.

"Selenium, arsenic, copper, cobalt, nickel, zinc, and vanadium were found in varying quantities in all the soils examined for them. Barium was found in all the soils except one sample derived from the Niobrara shale very rich in

calcium carbonate. Molybdenum was found only in the Pierre and Niobrara samples. The limiting quantities found were: Selenium, 0.01 to 22 p. p. m.; arsenic, 1 to 83 p. p. m.; copper, 1 to 44.6 p. p. m.; cobalt, 0 to 2.4 p. p. m.; nickel, 0.5 to 22.5 p. p. m.; zinc, 3 to 147 p. p. m.; barium, 0 to 2,123 p. p. m.; chromium, 0 to 93 p. p. m.; vanadium, from 5 to 430 p. p. m.; and molybdenum, 0 to 6 p. p. m. In the 11 erosion experiment station soils no evidence was secured indicating the presence of germanium, tin, gold, cadmium, tellurium, or the platinum metals.

"The distribution of trace elements found is shown to be very extensive, and their total absence from any soil is improbable. No attempt has been made to determine the effect of their presence on either the quality or quantity of vegetation [or] to show whether the quantities shown to be present are adequate or represent soil deficiencies. . . .

"The distribution of the trace elements within soil profiles shows the general relationships which are to be expected from the operation of the soil-forming processes. It seems clear that the primary sources of these elements are in the parent materials, and that soil-forming processes have not in most cases extensively modified the quantities present. Some eluviation is indicated by the distribution of vanadium and selenium, particularly in the soils which contain much iron oxide."

Some physico-chemical relationships found in four erosive soils of the Piedmont Plateau region, H. T. ROGERS (*Jour. Amer. Soc. Agron., 29 (1937), No. 1, pp. 1–9, fig. 1*).—Noting that "the clay pan nature of the B horizon of the Iredell, White Store, Helena, and Orange soils of the Piedmont Plateau region, linked with their apparent susceptibility to severe erosion, suggested a comparative study of their profiles", the author of this contribution from the Michigan Experiment Station reports such a study and finds that "an analysis of the data obtained . . . reveals some significant relationships between certain physical and chemical properties.

"A correlation coefficient of 0.923 ± 0.358 was found when hygroscopic water content was correlated with cation exchange capacity. These two properties are more closely related than percentage colloid and cation exchange capacity (correlation coefficient 0.752 ± 0.1053). This indicates that the ability of soil colloids to hold water against evaporation forces is an accurate measure of their ability to adsorb cations in ionic exchange. A high negative correlation (-0.712 ± 0.1196) existed between H-ion concentration and percentage base saturation. The data obtained show that there is very little relationship between H-ion concentration and total exchangeable hydrogen in soils with widely different cation exchange capacities. High correlation coefficients obtained for both hygroscopic water and maximum water-holding capacity and hygroscopic water and moisture equivalent show that any one of these values may be calculated from either of the others by means of a constant, with a high degree of accuracy."

Apparatus for the measurement of shrinkage coefficient of soils, B. N. SINGH and P. B. MATHUR (*Soil Sci., 43 (1937), No. 1, pp. 37–41, fig. 1*).—"The principle of the apparatus consists in finding the volume of the gas space in a soil chamber with and without a soil ball and determining the volume of the soil ball by subtracting the one from the other. The volume of the gas space in the soil chamber is determined in the following manner: A portion of gas is withdrawn from the soil chamber, and its volume is determined at the atmospheric pressure. The lowering of pressure in the soil chamber following the withdrawal of the gas is also noted. By applying the Boyle-Mariotte law, the volume of the gas space in the soil chamber is easily computed from these data."

A new method for determining the porosity of the soil, G. Torstensson and S. Eriksson (*Soil Sci., 42 (1936), No. 6, pp. 405–417, pl. 1, fig. 1*).—In a contribution from the Agriculture College of Sweden, the authors describe a "porosimeter" by means of which the air space in a soil sample may be determined by an application of Boyle's law. The sample is placed in a closed space of accurately known volume, and the change in the volume of the total air content of the apparatus corresponding to a known change (effected by an adjustment of a column of mercury in a graduated tube) in the pressure upon the contained air provides the data necessary for the calculation of the air space in the soil sample.

The authors also point out the possibility of determining the specific gravity of a dry soil sample and of determining the water content of a soil of known specific gravity.

A lettered diagram shows the nature and function of each detail of the apparatus, which is also shown as a whole in a photograph. The simple calculation involved is illustrated by a literal solution.

Accuracy of a soil thermograph, G. A. Mail (*Soil Sci., 43 (1937), No. 1, pp. 27–30, fig. 1*).—By means of temperature gradients and related conditions artificially controlled in a small body of soil in the laboratory so arranged as to magnify somewhat the sources of error met with in measurements of soil temperatures under natural conditions, the author of this contribution from the Montana Experiment Station has brought out certain limitations of the accuracy of corresponding field measurements.

"That the conditions described are most extreme and not likely to be encountered under normal conditions is granted, yet it is indicated that under certain circumstances the readings of a thermograph may not be exact. In the Centennial Valley in Montana, at 7,000 ft. altitude, one of these thermographs records winter soil temperatures at 2 in. Although the air temperatures drop to very low points, at times to −60° F. during the coldest part of the day, there is a snow blanket beneath which the soil surface temperatures will rarely go much below zero. With the bulb buried at so shallow a depth, most of the capillary cable is in the air, and, with the instrument head exposed to −60°, we have, therefore, in this instance an actual case where there is a 60° difference between the instrument and the bulb, and the record may be off as much as 3° from the actual temperature. The temperature gradient in some soils, especially within the surface 4 in., is often very sharp. With a thermograph bulb 1⅟16 in. in diameter buried with its median axis only 2 in. below the soil surface, as it is in grasshopper investigations, the combination of a sharp temperature gradient of some degrees within that space of 1⅟16 in. together with the conduction down the metal cable will result in error. For temperature measurements at greater depths this device ought to be very reliable.

"To overcome the afore-mentioned difficulty it is suggested that for temperature measurements of shallow depths at least 3 ft. of the capillary tubing be buried at the same depth as the bulb, so that the tube will have an opportunity to come to equilibrium with the surrounding temperature before it connects with the bulb."

On the formation of structure in soils.—II, Synthesis of aggregates; on the bonds uniting clay with sand and clay with humus, D. I. Sideri (*Soil Sci., 42 (1936), No. 6, pp. 461–481, pl. 1*).—Carrying forward experimental work recently noted (E. S. R., 76, p. 592), the author has found evidence supporting a new theory of structure formation based on the capacity of soil colloids to form phases of the aggregate state.

"The former conception that the particles forming the soil structural aggregate are held together by the tension of the water film is supplemented by the finding that the surface film creates a definite orientation of the particles in relation to one another. The tenacity of the bond between the separate parts of the soil structural aggregate cannot be explained by the presence of absorbed Ca. The explanation of the tenacity of this bond lies in the stability of the group arrangement of the particles. The most stable arrangement of particles is the homogeneous one. The formation of nonhomogeneous aggregates in soil—sand clay and clay humus—may be explained by the same laws which have been found to exist for mineral intergrowths. The impossibility of completely separating soil into its elementary parts is corroborated. In connection with the theory developed, it becomes necessary to revise the theory of soil texture. The subdivision of soil into stable and unstable groupings of particles appears to be more expedient. The influence of external conditions (vegetation, micro-organisms, tillage, pressure, freezing, etc.) on the formation of structure can be explained by the swarm theory."

Chemical and physical changes in soil colloids with advancing development in Illinois soils, R. H. Bray (*Soil Sci., 43 (1937), No. 1, pp. 1-14, figs. 2*).—The author describes, in a contribution from the Illinois Experiment Station, physical and chemical changes brought about by the five stages of weathering illustrated by the Hartsburg, Grundy, Harrison, Putnam, and Cisne silt loams. The physical study consisted mainly in the determination of the quantity and distribution of the coarse, fine, and extremely fine particle size fractions found in the colloidal material. With reference to chemical changes it was found, in part, that "the general tendency is for the K_2O, MgO, and Fe_2O_3 to decrease with advancing development and for the $\frac{SiO_2}{R_2O_3}$ ratio to increase." A chemical effect of physical weathering was found in the conversion of a mica-type mineral into a beidellite. "The mica loses its potash and part of its magnesium, taking up water in the process, and forms a beidellite-type mineral containing some magnesium and no potash but possessing base-exchange properties. Before physical weathering the beidellite is still attached to the mica. After physical weathering considerable of the beidellite but only a very small part of the mica is broken off, becoming part of the superfine (and fine) fraction. This will increase the K and Mg content of the coarse fraction and decrease its base-exchange capacity, and where quartz is present . . . the relative quartz content will be increased."

Soil conservation from the viewpoint of soil physics, R. Bradfield (*Jour. Amer. Soc. Agron., 29 (1937), No. 2, pp. 85-92*).—This discussion, contributed from the Ohio Experiment Station, brings out the original and the present status, and proceeds to the question "what can we do to insure good physical conditions in our arable soils?" A final section of the paper discusses mainly the beneficial effects of a grass-legume mixture grown for several years. A physical hypothesis to explain the nature of the improvement in the structure of the soil effected by such management is developed. The conclusion is that "the experience of our better farmers throughout the world, the carefully controlled experiments of our older experiment stations, the accumulated experiences of the older agricultural sections of Europe, all indicate that the most feasible way of maintaining soil structure is by combining arable agriculture with grassland farming."

Soil conservation from the viewpoint of soil chemistry, E. E. DeTurk (*Jour. Amer. Soc. Agron., 29 (1937), No. 2, pp. 93-112, figs. 4*).—This contribu-

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tion from the Illinois Experiment Station discusses in detail the natural deterioration of soils as a continuation of the processes involved in soil development. The chemical nature of the cycle is separately considered for the respective cases of potassium, of the soil organic matter, and of phosphorus. "The role of man in soil deterioration" is then similarly taken up under the subheadings colloids and base exchange, organic matter, phosphorus, and other elements. It is pointed out, in conclusion, that "nature and man have contributed in varying degree to the depletion of soils as reflected by their chemical characteristics. Remedial measures can effect restoration in varying degree, according to the nature and extent of the deterioration. What of the highest producing soils? Even though freed as completely as possible of fertility handicaps of the soil itself and located in a favorable climatic environment, average yields are only from one-half to three-fourths as high as the yields which it seems should be expected and which, as on the poor soils, are attained occasionally. This problem is not solved, but a step in advance is being taken. When the capacity of the soil to supply the crop is stepped up beyond the capacity of the crop to utilize it, the time is ripe for the soils men to team up with the workers in crop production and plant breeding in the interests of harmonizing the crop and the soil."

Soil deterioration and soil conservation from the viewpoint of soil microbiology, S. A. Waksman (*Jour. Amer. Soc. Agron., 29 (1937), No. 2, pp. 113–122*).—The author of the third and final paper of this soil conservation symposium (a contribution from the New Jersey Experiment Stations) finds, with respect to the influence of soil micro-organisms in the development and deterioration of soils, that "the problems of water and wind erosion of the soil, as well as soil deterioration due to improper systems of cultivation, are closely associated with the problem of soil organic matter. A decrease in the organic matter content of the soil accompanies soil deterioration and is in itself a cause for further deterioration of the soil, while an increase of the content of organic matter and nitrogen is a symbol of soil improvement. Micro-organisms are closely associated both with the formation and with the destruction of the organic matter in the soil and with an increase or a decrease of the available nitrogen. Any systems of permanent soil improvement or soil conservation must, therefore, consider the influence of soil treatment upon the activities of the soil-inhabiting micro-organisms, as well as the methods of utilizing their activities in order to bring about a permanent system of agriculture. Furthermore, soil erosion results in the loss of the 'active' or 'living' surface layer of the soil, leaving the 'dead' subsoil. The latter, because of lack of aeration and lack of sufficient nutrients, limits the growth of the important micro-organisms. The soil may also become infested with pathogenic organisms as a result of certain systems of cropping, thus leading to a condition which characterizes 'sick' or 'exhausted' soils. This condition can be prevented or corrected by proper systems of crop rotation and soil improvement. Soil conservation must keep a proper balance of the microbiological population of the soil and a proper state of microbiological efficiency."

Soil conservation reconnaissance survey of the southern Great Plains wind-erosion area, A. H. Joel (*U. S. Dept. Agr., Tech. Bul. 556 (1937), pp. 68, pls. 14, figs. 2*).—The author describes the topography, natural vegetation, agriculture, and agricultural history of the area, dividing the lands surveyed into nine groups of soils "recognized and mapped on the basis of their inherent characteristics as related to their susceptibility to erosion and to agricultural adaptations."

Other findings of the survey are, in part, as follows: "For the area as a whole the erosion situation is serious. A total of 97.6 percent of the entire area has been affected by accelerated erosion of one type or another. A total of 53.4 percent of the area has been affected to a serious degree by accelerated erosion induced by wind or water or both. Soil types of all the soil groups represented, except the stream bottom and terrace lands of group 8, have been seriously affected. Water erosion over the area is not serious, except locally. Only 13.6 percent of the area has been affected by water erosion and only 4.4 percent affected by water erosion to a serious degree. Soils of group 9, which includes most of the steeper slopes, have been affected to the greatest extent. The need for water conservation over the area as a whole is urgent. It is essential for the economic production of crops to improve the ranges and to check wind erosion by increasing vegetative protection both on range and on cultivated lands. Wind erosion is generally serious over the area, in many places alarming. Eighty-three and three-tenths percent of the whole area may be considered affected to a variable degree by wind-erosion damage of one type or another, and 42.5 percent of the area by wind erosion to a serious degree. A total of 91.6 percent of all erosion in the area is by wind. Combined removal and accumulation is by far the most extensive type of wind erosion, 58.2 percent of the whole area having been affected in this manner. . . .

"Some of the more important measures recommended are (1) basic soil-conservation surveys and economic and social surveys of the whole affected area at an early date; (2) the early effective application of an emergency erosion-control and long-time soil-conservation program; (3) general reorganization of land use to include the removal of certain lands from cultivation, the reorganization of such lands into large units for large-scale livestock production, with crop production at economic minimum, revegetation where advisable, and the general adoption of cropping and grazing practices that are suitable to the area and that will conserve moisture and control erosion; and (4) the economic and social adjustments necessary to effect the above recommendations. Education and legislation are necessary to encourage and enforce the necessary cooperation of the many individuals, business interests, and groups involved."

Soil conservation practices, R. E. Uhland (*U. S. Dept. Agr., Soil Conserv. Serv., 1936, pp. [2]+179, figs. 85*).—The purpose of this handbook is to bring together in concise form some of the latest technical information on erosion control, with special reference to Missouri and Iowa. It contains sections on land inventory and utilization, cropping practices (agronomy), forestry practices, wildlife conservation, and engineering methods.

Conservation farming practices and flood control, H. H. Bennett (*U. S. Dept. Agr., Misc. Pub. 253 (1936), pp. 16, figs. 15*).—A popular discussion is given of a few of the conservation farming practices found by experience and investigation to be effective in erosion control and which promise substantial aid to upstream flood control and soil protection.

Soil conservation practices in actual use by farmers, Eastern Highland Rim, 1932–1936, C. E. Allred and D. H. Ebry (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 28 (1937), pp. IV+38, figs. 11*).—Approximately 95 percent of the 109 farmers surveyed, in cooperation with the U. S. Department of Agriculture, have done gully control work on their farms, indicating that erosion is a problem on almost all the farms. A list of plants and plans adapted to the area is appended.

Soil moisture conservation, R. R. Drake (*Agr. Engin., 18 (1937), No. 1, pp. 15, 16, figs. 2*).—In a brief contribution from the U. S. D. A. Soil Conservation

Service data are presented showing the effect of tillage in storing water in the soil and the amount of moisture used by the wheat crop on continuous wheat and fallow land. Attention is drawn to the possible usefulness of basin lister tillage on fallow land in moisture conservation.

[Soil erosion control investigations by the South Carolina Station], T. C. PEELE, F. MOSER, and C. S. PATRICK (*South Carolina Sta. Rpt. 1936, pp. 19, 21–23, 62–64, figs. 4*).—The progress results are briefly presented of investigations in soil erosion control, including studies of water run-off under various cropping systems and terracing.

Emergency wind-erosion control, G. K. RULE (*U. S. Dept. Agr. Circ. 430 (1937), pp 11, figs. 9*).—This circular suggests two definitely protective measures which are practicable for immediate application in the Great Plains wind-erosion area. The farmer in this region "can protect stalk, stubble, and pasture fields from being overgrazed or burned, and he can have his unprotected fields roughened before the soil starts drifting."

Of the burning or overgrazing of crop residues, it is noted that "some of the worst examples of wind erosion on the Plains may be traced directly to these two destructive practices. . . . If it is absolutely necessary to pasture these fields, it should be done under close supervision. Flocks or herds should be removed before the ground cover is seriously jeopardized."

Of the second measure of protection, the roughening of the soil before the ground freezes in the fall and the re-treatment of leveled or blown spots in the spring before the onset of strong winds, it is pointed out that in general "obstructions of any kind in the path of a moving stream of wind-blown soil will check the driving force of the wind and pile up the soil. . . . Any tillage implement that roughens the surface and leaves it furrowed may be used. More permanent results are obtained if the furrows are deep and if the surface is left in a cloddy condition."

Of various means for securing an effective roughening, the lister is preferred wherever its use is practicable because its deeper furrows provide for more effective trapping of moving soil and of heavy rains. The shovel cultivator, with the two outside shovels set straight and all others removed, is considered "very effective" and cheaper to operate because of its light draft and its rapidity. Its furrows have, however, "little capacity for storing rain water." It is further pointed out that "the chisel cultivator is an effective implement to use if the soil is so dry that clods cannot be brought to the surface with a lister. . . . On land too hard and dry to work with a lister some farmers have had success in using the 'wide-spaced one-way.' This implement is an ordinary one-way disk plow with most of the disks removed. Other types of implements at hand may be used, but the important point to consider is their effectiveness in erecting clod and furrow barriers against the wind so that moving soil may be trapped." Strip listing and the use of the hole digger are also mentioned as useful practices, and "if it is impracticable to run the tillage furrows on the contour because the land is excessively hummocky, or for other reasons, the basin lister may be used. . . . This tool is very effective in conserving moisture. Even though the furrows are run only on an approximate contour, each little dam across the furrow channel traps some water." Contour listing appears the most effective of these measures, however, and one of the illustrations strikingly shows the effectiveness of contour listing in holding the water of a 2-in. rainfall.

Since any form of emergency tillage "must be considered as only a temporary measure", however, "the pressing problem for the future is to find ways of minimizing the hazard of having bare land exposed to the wind. The land

must be given a more adequate cover of native grass, and cultivated crops better adapted to the Great Plains region must be grown."

Early erosion-control practices in Virginia, A. R. Hall (*U. S. Dept. Agr., Misc. Pub. 256 (1937), pp. 31, figs. 4*).—This is a popular historical document, accompanied by a bibliography of 93 references to the literature.

Saving Virginia soils, L. Carrier et al. (*U. S. Dept. Agr., Soil Conserv. Serv., 1936, SCS-MP-16, pp. [1]+23, figs. 5*).—This is a popular treatise on soil conservation by terracing, contour tillage, crop rotation, and erosion and run-off control measures.

Planting of woody plants for erosion control, G. W. Hood (*U. S. Dept. Agr., Soil Conserv. Serv. Bul. 1, rev. (1936), pp. [1]+38, pl. 1, figs. 16*).—This is an elementary and general discussion of the subject.

Soil fertility studies, N. McKaig, Jr., and E. M. Rollier (*South. Carolina Sta. Rpt. 1936, pp. 115–119*).—Lysimeter trials of various treatments of Norfolk sands of low organic matter and colloid content and of low productivity are noted.

Experiments reveal soil deficiencies, A. B. Bryan (*Better Crops with Plant Food, 21 (1936), No. 1, pp. 18–20, 40, 41, figs. 2*).—This is a brief discussion of fertilizer experiments of the usual type, carried out at the South Carolina Sandhill Substation.

The nitrate nitrogen in the soil as influenced by the crop and the soil treatments, W. A. Albrecht (*Missouri Sta. Res. Bul. 250 (1937), pp. 27, figs. 20*).—This study discusses the results of determinations of the nitrate nitrogen in the soil of a series of 11 plats of a rolling phase of Shelby silt loam under various crops and cultural variations during 13 yr.

"Such determinations do not measure the amount of nitrates produced or removed but rather the nitrate level at which the production of nitrates is temporarily balanced against their consumption by the plants as the crop above the soil or by the nitrate consuming micro-organisms within it. They measure, however, the lowest level to which the supply in the soil can be, or is, exhausted by the crops or by leaching and the heights to which the accumulation may mount against, or in absence of, these reducing forces. That the crop is a significant factor in removing the nitrates is shown by the lower nitrate accumulation in the cropped soil in contrast to that in the fallowed soil. Without the crop the seasonal nitrate nitrogen levels fluctuated from approximately 21 lb. at the lower level to 42 lb. as the upper figure. For the crops, their exhaustion of the nitrates was very similar whether grass, corn, or wheat. The similarity was greatest between wheat and grass whose average lower levels were . . . 6 lb. and upper levels . . . 12 lb. . . .

"Soil tillage is a beneficial soil treatment because of its effect in bringing about an increased supply of available nitrogen or nitrate for the crop growing on the soils. Turning the soil with the moldboard plow is the foremost tillage performance to increase nitrate production. Surface cultivation likewise stimulates nitrate production. . . .

"Fertilizers did not bring about any great change in the level to which nitrates were exhausted. Their effects were generally unnoticed in terms of the measurement of the nitrate nitrogen supply on the soil though there were suggestions that they encouraged early season nitrate accumulations and aided in the late season nitrate removals. . . .

"The most detrimental effect to nitrate accumulation in a fallow soil in these studies was manifested by the straw mulch. Under the application of 6 tons of straw per acre, the fallow soil failed to accumulate nitrates above the levels common in soils growing crops. This effect was not overcome when ni-

trogenous green manures were turned under in the form of sweetclover. The growth of corn in the straw-mulched soil was, however, the equivalent of that on unmulched soils where higher accumulations of nitrate occurred.

"Whether continuous cropping or crop rotation was practiced, the level of nitrate nitrogen under the same crop was but little disturbed as a general average. The nitrates under corn continuously were closely similar to those under corn alternated with a legume crop, to those under corn in a 3-yr. rotation handled as a livestock system of farming, and to those under the grain system of soil management. . . .

"Perhaps the most noticeable feature of the nitrate levels observed in this soil was the decline of the levels with time. Under the wheat or under the corn, and likewise under the fallow soils, both mulched and unmulched, the nitrate levels observed were lower as the years of the study advanced. This points forcibly to the decline in ability of this soil to deliver nitrates early in the season and at high levels as cropping continued. These levels had fallen so low that it was difficult to establish sod legumes such as red clover and sweetclover on these soils even with an application of finely ground limestone and commercial fertilizer. These declines represented reductions in levels as much as 50 percent, and should direct our attention to the significant speed at which the soil's power to produce nitrates is being depleted when such reductions occur within a period as brief as 13 yr."

Methods of incorporating organic matter with the soil in relation to nitrogen accumulations, W. A. ALBRECHT (*Missouri Sta. Res. Bul. 249 (1936), pp. 16, figs. 8*).—Analyses of soils sampled annually where 2.5 tons of clover (106.2 lb. of nitrogen) per acre were turned under each year and where this quantity was applied on the surface and turned under the following year showed that nitrogen accumulated slightly more rapidly in the latter than in the former treatment, the difference amounting to about 3 percent of the nitrogen applied.

"The study suggests that as a general average where clover is used for soil improvement in this manner, about one-third of the annual application may be considered as contributed to the residual or insoluble nitrogen supply in the soil, while two-thirds are mobilized or transformed into soluble forms. With these heavy annual applications of clover, the soil supply of nitrogen was raised above its initial content at a rate amounting to more than 20 percent of the annually applied nitrogen. Its effects in offsetting declines of nitrogen in the soil, added to this, make its effects in building up the soil nitrogen approach the rate of one-third of the nitrogen applied annually.

"These results were obtained on a shallow surface soil underlain by a plastic clay subsoil. Slight increases in the upper subsoil content of nitrogen resulted where significant increases occurred in the surface soil."

The tolerance of nitrate by pure cultures of Azotobacter, P. L. GAINEY (*Soil Sci., 42 (1936), No. 6, pp. 445–459*).—The author reports from the Kansas Experiment Station that field and laboratory observations on the effect of nitrates upon the *Azotobacter* flora of soils tend to support the recorded observations that relatively high concentrations in a soil containing *Azotobacter* tend to cause a decrease in the density of the *Azotobacter* population. Observation of 65 pure cultures of *Azotobacter* isolated from local soils "has shown conclusively that there is a marked variation in the sensitivity of different strains to nitrate nitrogen. That this sensitivity is due to the NO_3 ion and not to the cation is indicated by the fact that the same injurious effect is produced by potassium, sodium, and ammonium nitrate. That the nitrogen alone is not responsible for the phenomenon is indicated by the fact that upon the addition of nitrogen in the form of urea the injurious effect is not evident

until sufficient time has elapsed to enable the processes of nitrification to transform the urea nitrogen into nitrate nitrogen; also by the fact that the injurious effect of ammonium nitrate is not proportional to the total but rather to its NO_3-N content.

"With the toxic action of the NO_3 upon pure cultures established, it is not necessary to postulate an antagonistic action of other organisms stimulated by the nitrate to account for the reduction in *Azotobacter* population following an application of nitrate nitrogen to a soil. Some evidence is submitted . . . in support of the view that the variation in sensitivity of the *Azotobacter* of different soils may be associated with the sensitivity of the particular strains inhabiting the soil in question.

"Relative to the apparently much lower concentration of NO_3 that proved toxic to *Azotobacter* in soils, as compared with that necessary in case of pure cultures, attention should be directed to the fact that the nitrate content of soils is always recorded on a dry-soil basis. Since nitrates are very soluble, *such salts are probably found dissolved in the soil moisture. The actual* effective concentration, therefore, as far as the *Azotobacter* are influenced, would vary inversely with the moisture content of the soil, and in the data here presented would be from 3 to 20 times the concentration calculated upon a dry-soil basis. The fact should also be kept in mind that all the pure culture studies here recorded were made upon mannite agar. Just what influence the colloidal agar agar exerted upon the concentration of NO_3 tolerated by *Azotobacter* is problematic. . . .

"Since a relatively low concentration of NO_3-N has been found toxic in soil and since the speed of the action . . . may be rapid, it is not impossible that the differences observed in the density of the *Azotobacter* population in 'fertile' and 'nonfertile' soils were due to differences in the NO_3-N content that existed in the pair of samples at some time. In view of the relative ease with which increased tolerance can be induced in the laboratory, however, it is difficult to see why a natural tolerance to the concentrations of NO_3 ordinarily encountered in the more fertile soils, or in soils fertilized with nitrate nitrogen, is not developed."

Associative and antagonistic effects of microorganisms, I–III (*Soil Sci., 43 (1937), No. 1, pp. 51–92*).—The three papers here noted form part of a serial contribution from the New Jersey Experiment Stations.

I. *Historical review of antagonistic relationships*, S. A. Waksman (pp. 51–68).—From a review of more than 100 papers the author concludes, in part, that "numerous organisms, comprising bacteria, fungi, actinomyces, and protozoa, bring about injurious or destructive effects upon themselves or upon other soil organisms. In some cases the injurious effect may be due to *competition for nutrients, in other cases it is due to a change in the environ*mental conditions of the substrate, especially oxidation-reduction potential and reaction. More frequently it is due to the formation of substances which exert a definite toxic effect. The production of these toxic substances by various specific micro-organisms is greatly influenced by the reaction, temperature, *and aeration of the substrate*, as well as by the presence of other organisms. . . . Some of the soil organisms, notably the protozoa, are able to destroy directly other members of the soil population, especially the bacteria. This phenomenon need not be injurious, however, to the specific processes brought about by these bacteria. The claims concerning the effects of protozoa on soil processes, *based upon their growth on artificial culture media*, appear to be exaggerated. The available information concerning antagonism among micro-organisms may be useful in explaining the behavior of various specific organisms. It is little more than suggestive, however, in explain-

ing the . . . interrelationships of the numerous micro-organisms comprising the soil population and the equilibrium condition normally found to exist in this population."

II. *Antagonistic effects of microorganisms grown on artificial substrates*, S. A. Waksman and J. W. Foster (pp. 69–76).—The authors here report experiments showing that various soil organisms found among the fungi, actinomyces, and bacteria are capable of producing, when grown on synthetic media, substances which are antagonistic to the growth of other soil organisms. In addition to a number of other mixed culture experiments, "a detailed study has been made of the antagonistic effect of one species of *Actinomyces* [designated '*Actinomyces* 3065'] upon a variety of fungi, bacteria, and other actinomyces. The inhibiting effect produced by this organism was shown not to be due to exhaustion of nutrients or to unfavorable changes in reaction but was found to be specific in nature. The maximum production of the antagonistic substance took place in the cultures of the actinomyces 7 to 18 days old. The substance was then gradually destroyed. Aeration and heat brought about rapid destruction of this substance."

III. *Associative and antagonistic relationships in the decomposition of plant residues*, S. A. Waksman and I. J. Hutchings (pp. 77–92).—This part of the series reports upon a study of the associative growth of different fungi, actinomyces, and bacteria upon different plant materials and of the resultant decomposition of the latter.

"It was found that the presence of one organism may modify considerably the growth of another. The decomposition of alfalfa by a *Trichoderma* was modified considerably by the presence of various fungi and bacteria. These organisms, although by themselves unable to decompose cellulose, were capable of favoring the decomposition of the cellulose by *Trichoderma*. Cornstalks could not be attacked by pure cultures of actinomyces. However, when certain fungi were previously grown upon this plant material, the growth of the actinomyces was greatly favored. This was accompanied by increased decomposition. The unfavorable condition could also be corrected by the addition of lime, and only partly by nitrate and phosphate. Different fungi were found to vary considerably in their ability to attack the various chemical constituents of plant residues and to exert varying influences upon the activities of other organisms, as well as of the soil population as a whole. *Azotobacter* was found capable of utilizing the carbohydrates of oat straw, but it did not fix any nitrogen. In the presence of cellulose-decomposing fungi it also made good growth, but this process, as well, was not accompanied by nitrogen fixation. The combined nitrogen of the straw was utilized by this organism for its synthetic needs. Lignin decomposition took place only when actinomyces were present in the mixture of organisms."

Formamide as a nitrogenous fertilizer, C. J. Rehling and J. R. Taylor, Jr. (*Jour. Amer. Soc. Agron.*, *29* (*1937*), *No. 2*, *pp. 134–144*, *figs. 3*).—According to experimental results, reported from the West Virginia and Alabama Experiment Stations, "ammonification of formamide was generally complete for 2 days in the soil. Nitrification of formamide and ammonium formate proceeds in the soil in the same manner as that of urea. Formamide, urea, and various formates were found to be decomposed into carbonates in 2 to 6 days in the soil, depending upon soil fertility. Greenhouse and field cropping studies indicated equal efficiency of formamide-containing and formamide-free mixed fertilizers in increasing crop growth."

Potassium retained in the exchangeable form by some Maryland soils, R. P. Thomas and J. E. Schueler, Jr. (*Jour. Amer. Soc. Agron.*, *29* (*1937*), *No. 1*, *pp. 17–[illegible]*).—The authors determined, at the Maryland Experiment Station, the

exchangeable potassium content of the Sassafras, Manor, Penn, Berks, and Hagerstown soil series in orchards undergoing fertilizer tests. The potassium added in the fertilizers annually during the 4 yr. of these tests had ranged, at the time of sampling, from 230 to 970 lb. per acre. The determinations were made in the first, second, and third 6-in. layers.

"The results . . . indicate that light-textured soils are unable to retain large amounts of exchangeable potassium. The subsoils have an even smaller retention capacity. Unless the exchange complex of these soils is increased by incorporating organic matter, potash fertilizer should not be applied in large amounts but more often. The movement of potassium in the heavy-textured soils was much less than in the light-textured soils. The slow movement of this ion is probably due to the high exchange capacity of these soils. This does not necessarily indicate that these soils should receive a large potash fertilization. The movement of this element in the silt loam soils was intermediate between the sandy and clay soils."

The influence of phosphate fertilization upon the amphoteric properties of Coastal Plain soils, J. B. HESTER (*Jour. Amer. Soc. Agron., 29 (1937), No. 1, pp. 10–16*).—The author discusses, in a communication from the Virginia Truck Experiment Station, the phosphate-absorbing power of the soils, the availability of phosphorus, the clay composition and phosphate solubility, the phosphate-fixing power of the Norfolk soil used in these experiments, and the mechanism of phosphate fixation, and concludes from the data given that "the seat of the phosphate-absorbing power of the soil is in the basoid constituent of the soil colloid."

Suitable fertilizer mixtures for different crops, including the functions of chief plant nutrients, W. H. RANKIN (*North Carolina Sta. Agron. Inform. Circ. 103 (1937), pp. [1]+11*).—Home-made fertilizer mixtures considered suitable for various combinations of soil and crop are suggested.

Garden fertilizers, W. B. BALCH (*Kans. State Hort. Soc. Bien. Rpt., 43 (1934–35), pp. 182, 183*).—This is a brief popular article from the Kansas Experiment Station, including barnyard manures, cover crops, and other decaying organic matter, and commercial fertilizers.

Analyses of commercial fertilizers, A. P. BRUCE and E. BURKE (*Montana Sta. Bul. 331 (1937), pp. 12*).—This bulletin is the first report on fertilizer analyses published by the station as a result of the State fertilizer law of 1931, amended to provide for such publications in 1935. The amended law is quoted and discussed, terms are defined, and the analyses are very briefly discussed.

Inspection of commercial fertilizers for 1936, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul. 294 (1936), pp. 12*).—This bulletin contains the usual analytical report on the fertilizers offered for sale in 1936 (E. S. R., 75, p. 179).

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures for 1936, C. S. CATHCART (*New Jersey Stas. Bul. 619 (1936), pp. 31*).—The greater part of the fertilizer analysis data for 1936 is included in the present bulletin, together with cost per pound of the plant-food element in various single plant-food sources of nitrogen, phosphate, and potassium. Data for home mixtures as well as for commercial fertilizers are given.

AGRICULTURAL BOTANY

[Botanical work by the Florida Station] (*Florida Sta. Rpt. 1936, pp. 62, 94*).—Data are presented on nutrient salt concentration in the soil, with special reference to the trace elements, by R. B. French; and on the collection and preservation of specimens of Florida plants, by E. West and L. Arnold.

[Botanical studies by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 336 (1936), pp. 13, 14, 27, 28, fig. 1*).—Brief reports are given on a photoelectric apparatus for measuring leaf aeas, by. D. E. H. Frear; and ultraviolet radiation of plants, by H. W. Popp.

A bibliography on the use of photoelectric cells in plant investigations, F. M. TURRELL and L. WALDBAUER (*Iowa Acad. Sci. Proc., 42 (1935), pp. 67–70*).—The authors offer this bibliography of nearly 4 pages in the hope of bringing together recent developments (many since 1931) in a form usable to plant physiologists and others interested in colorimetric, turbidimetric, and various light measurements.

The polygonal presentation of polyphase phenomena, A. H. HUTCHINSON (*Roy. Soc. Canada Trans., 3. ser., 30 (1936), Sect. V, pp. 19–26, pls. 3*).—Apropos of the subject of graphical representation of biological data, the author first delimits the problem and then proceeds to discussions of the development of polygonal charting, polygonal graphing of physiological data, the graphing of oceanographic data, the graphing of the characteristics of families of plants and animals, and further developments of polygonal graphing. The construction and interpretation of polygonal graphs are also treated, and examples are given.

Some remarks on the photosynthesis of green plants, J. WEISS (*Jour. Gen. Physiol., 20 (1937), No. 3, pp. 501–509*).—This is a critical review and discussion from which "it is suggested that in the assimilation process of green plants the reduction of the CO_2 takes place with the help of Fe^{++} ions (present in the chloroplast) under the influence of light, which is absorbed by a sensitizing chlorophyll-CO_2-complex. It seems that the chlorophyll has to fulfill two different functions depending on its situation in the chloroplast. The chlorophyll molecules on the surface of the lipoid phase (in contact with an aqueous phase containing Fe^{++}) combine with CO_2 to form a light absorbing chlorophyll-CO_2-complex and in this way take part in the reduction of the CO_2. The light energy is also absorbed by the greater portion of the chlorophyll, which is dissolved in the interior of the lipoid phase, and eventually handed over to the chlorophyll molecules on the surface. The photosynthetic unit of Emerson and Arnold [E. S. R., 74, p. 761] may be determined by the ratio: (Active) chlorophyll in the surface of the lipoid phase/chlorophyll dissolved in the interior of the lipoid phase, so that for every chlorophyll molecule on the surface there are about 500 molecules in the interior, which provide it with the necessary quanta."

The light factor in physiological processes [trans. title], A. SEYBOLD (*Jahrb. Wiss. Bot., 82 (1936), No. 5, pp. 741–795, figs. 20*).—The author considers the phyiological effects of light quality and quantity from different parts of the spectrum on sun, shade, and water plants; compares artificial light in these respects; and discusses the light field in nature and under experimental conditions with reference to the germination of seeds and of fern spores, in relation to deciduous leaves and to transpiration resistance, and the light absorption of carotinoids.

The inner daily rhythm as the basis of photoperiodic reactions [trans. title], E. BÜNNING (*Ber. Deut. Bot. Gesell., 54 (1936), No. 10, pp. 590–607, figs. 4*).—The photoperiodic effect is said to arise through a lack of agreement between the inner and outer rhythms. Light reacts favorably on the reproductive development as long as the plants remain in the morning phase of the inner rhythm (recognizable in the rising upward of the leaves), but in an inhibitory manner during the evening phase (recognizable in the lowering of

the leaves). From the literature and the results of the author's work, it is concluded that the physiological basis of photoperiodism lies in the inner rhythm.

The effect of temperature upon the responses of plants to photoperiod, R. H. ROBERTS and B. E. STRUCKMEYER (*Science, 85 (1937), No. 2203, pp. 290, 291*).—In experiments at the University of Wisconsin with over 100 varieties of plants grown under a range of controlled photoperiods, temperatures, and some other variables, it was found that temperatures a little above or below the usual range employed in greenhouse culture altered the type of response of some of the plants with respect to length of day. Poinsettias, for example, in winter short days bloomed normally at 60°–65° F., but at 5°–8° lower showed little tendency to bloom, while at temperatures as much higher they remained strongly vegetative. Altered responses were also met with in Klondyke cosmos, *Rudbeckia*, "alfalfa (seed setting), winter barley, castor-beans, wax beans, Chinese cabbage, chrysanthemum, white clover, geranium, hemp, jimsonweed, lettuce, pansy, pigweed, spring rye, spinach, stock, timothy, and spring wheat."

The effect of alternate periods of light and darkness of short duration on the growth of the cucumber, G. B. PORTSMOUTH (*Ann. Bot. [London], n. ser., 1 (1937), No. 1, pp. 175–189, figs. 6*).—The much lower growth rate with short-period intermittent light was shown to result from reduction in the maximum size of the individual leaves produced and from delay in unfolding of the successive leaves. The main effect of variation in the period of alternation proved to be due to variations in net assimilation rate per unit area. The carbohydrate supply appeared adequate to maintain leaf growth near the optimum both under continuous light and with 12-hr. alternations. Observations of stomatal aperture showed part, at least, of the differences in assimilation rates to be due to their closure with the 1-min. alternations.

The necessity of a considerable period of darkness for the maintenance of high assimilation rates is postulated in explanation of the results presented.

The influence of environment on the growth and metabolism of the tomato plant.—II, The relationship between water content and assimilation, R. MELVILLE (*Ann. Bot. [London], n. ser., 1 (1937), No. 1, pp. 153–174, figs. 8*).—Continuing this series,[2] it is shown that "the percentage water content of the leaves at the beginning of a period of assimilation gives an indication of the effect of internal factors on the subsequent assimilation. The internal factors are dependent on the previous history of the plant."

Limited growth and abnormalities in excised corn root tips, W. J. ROBBINS and V. B. WHITE (*Bot. Gaz., 98 (1936), No. 2, pp. 209–242, figs. 6*).—Excised root tips in solution C ($Ca(NO_3)_2$, $MgSO_4$, KH_2PO_4, $FeCl_3$, and dextrose) gave limited growth and sometimes became abnormal. Similar results followed the use of a modified Pfeffer solution containing dextrose. The amount of growth in solution C varied with the brand of dextrose, even with dextrose of high purity, and substitution of levulose, sucrose, xylose, or maltose was of no benefit. In fact, xylose and maltose gave very poor growth. Growth was improved by addition to solution C of Difco agar, aqueous extracts of agar, qualitative filter paper or its aqueous extracts, soluble starch, autolyzed or dried brewers' yeast, or a mixture of salts of manganese, boron, and zinc. Best results were obtained by addition of qualitative filter paper. Exposure of excised root tips originally 1 cm long for 24 or 48 hr. on the surface of a semisolid

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[2] Bolas, B. D., and Melville, R. Ann. Bot. [London], 47 (1933), No. 187, pp. 673–688, figs. 14.

agar medium or on moist qualitative filter paper markedly favored their later growth in solution C. Exposure in a moist chamber or washing the tips in redistilled water before culture in solution C failed to benefit. Recutting excised roots after pretreatment on filter paper failed to affect later growth in this solution. Increased aeration in the liquid medium increased the growth and delayed the appearance of abnormalities. Reducing the acidity, increasing the salt concentration, substituting ferric tartrate or citrate for $FeCl_3$, adding quantitative filter paper, absorbent cotton, $CuSO_4$, thallium nitrate, glutathione, or vitamin B failed to benefit, but pantothenic acid was beneficial in some cases. Pfeffer or Uspenski solutions, or the solution used by P. R. White for culture of excised tomato roots, proved no more effective than solution C.

The maximum growth of individual excised root tips 1 mm long was 61.2 cm (0.9 cm per 24 hr.); of root tips 2 mm long, 85.0 cm (1.4 cm per 24 hr.); and of root tips 10 mm long, 98.2 cm (2.4 cm per 24 hr.).

It is believed that the poor growth in solution C and the like results from a deficiency, a part of which, at least, is inorganic.

A bibliography of 18 titles is appended.

Ecological and physiological studies on the blooming of oat flowers, G. Misonoo (*Jour. Faculty Agr., Hokkaido Imp. Univ., 37 (1936), No. 4, pp. 211–337, pl. 1, fig. 1*).—This monograph presents the results of a comprehensive study of the relations of environmental factors (temperature, humidity, rainfall, wind, and sunlight) to blooming, the control of blooming, and the physiological and chemical changes involved. An appendix (36 pages) presents tabulated data, and a bibliography of 42 titles is appended.

The electrometric determination of plant quality, using potato tubers.—II, Investigations on the acidity of macerated tissue of potato tubers [trans. title], H. Wartenberg, A. Hey, and A. Tahsin (*Arb. Biol. Reichsanst. Land u. Forstw., 21 (1935), No. 4, pp. 499–516, figs. 2*).—Continuing this series of studies (E. S. R., 75, p. 459), the results led to the belief that the acidity of the macerated tissues is controlled by a carbonate-bicarbonate system and that the differences in plant-quality potential are influenced but little by differences in acidity. The potential measured is therefore probably the reduction-oxidation potential.

The electrometric determination of plant quality, using potato tubers.—III, The redox potential of macerated tissue of potato tubers [trans. title], H. Wartenberg and A. Hey (*Planta, Arch. Wiss. Bot., 25 (1936), No. 2, pp. 258–281, fig. 1*).—The authors present discussions of the effects of different amounts of atmospheric oxygen on the potential, the significance of melanin formation as a natural and automatic control on the production of the anaerobic state, the phenomenon and theory of electrolyte action, the effect of electrolyte addition on the value of the constant potential, and the question of potential constancy.

The electrometric determination of plant quality, using potato tubers.—IV, The redox potential of a suspension of macerated tissue of potato tubers as an index of degeneration [trans. title], H. Wartenberg and A. Hey (*Phytopath. Ztschr., 9 (1936), No. 6, pp. 531–569, figs. 16*).—Macerated tissue suspensions of tubers with degeneration diseases gave a more negative potential value than those from sound tubers.

The nitrogen nutrition of green plants, G. T. Nightingale (*Bot. Rev., 3 (1937), No. 3, pp. 85–174*).—In this review the subject is discussed under the following headings: Synthesis and hydrolysis of storage proteins, synthesis and hydrolysis of leaf proteins, metabolism of stems, and new synthesis of organic nitrogen from nitrogenous nutrients, storage and assimilation of

nitrate, external factors influencing ammonium and nitrate nutrition, internal factors influencing ammonium and nitrate nutrition, comparative metabolism of ammonium- and nitrate-supplied plants, nitrite nutrition, absorption of organic compounds of nitrogen, growth in relation to available nitrate, effects of temperature on nitrate nutrition, and effects of day length on nitrate nutrition.

Three hundred and five references to the literature are cited.

Zinc as an essential element for sugar beets and potato plants, D. V. VAN SCHREVEN (*Meded. Inst. Suikerbieten.*, *7 (1937), No. 1, pp. 26, pls. 2; Eng. abs., pp. 18–21*).—Following a review of the literature (with a bibliography of 80 titles), the author describes the methods and results of his own water-culture experiments with and without zinc.

Potato plants deprived of zinc remained behind in growth, and the leaves had the primary symptoms of leaf roll disease and were discolored and spotted. Histological and macroscopic comparisons of plants with and without zinc are discussed in detail. The differences in height of the plants, in foliage and tuber weights, and in average total plant weights were significant, but the difference between root weights was not.

Similar comparisons are made for the tests with sugar beets. Here the differences in taproot weight, relation of foliage and taproot weights, and in sugar content were significant, while the difference in average weight of foliage was not. The dry matter content of the foliage and taproots of the plants with zinc appeared to be higher, but the ash content of the foliage and roots was slightly lower than for the zinc-deficient plants.

Histological reactions of bean plants to indoleacetic acid, E. J. KRAUS, N. A. BROWN, and K. C. HAMNER (*Bot. Gaz.*, *98 (1936), No. 2, pp. 370–420, figs. 33*).—Living cells of the stem of red kidney bean are shown to be responsive to applications of indoleacetic acid, the mixture used consisting of 30 mg of indoleacetic acid per gram of pure lanolin. Gross observations over several weeks were made on the untreated and treated stems without removal from the plant, and histological studies were carried out on material collected and preserved at 6-hr. intervals up to a total of 168 hr. The results obtained (described and illustrated in great detail) led to the conclusion that the histological developments following application of indoleacetic acid closely resemble many of those associated with crown gall induced by *Bacterium tumefaciens* [=*Phytomonas tumefaciens*].

"The most striking feature shown by stems treated with lanolin mixture is the very great speeding up of nuclear divisions, especially in cells near the surface of application. Such divisions result in a multinucleate condition of many of the cells. Later cell division occurs, and the derived cells may remain highly meristematic for long periods of time. It does not seem essential to assume that the developmental patterns expressed by tissues following treatment necessarily result from an effect altering the genetic composition of the chromosomes to the degrees that parts of chromosomes or whole chromosomes have been lost."

Retarded germination in the seed of Hypericum perforatum caused by calcium, H. A. BORTHWICK (*Bot. Gaz.*, *98 (1936), No. 2, pp. 270–282, figs. 6*).—Studies at the University of California indicated that tap water retarded germination as contrasted with distilled water. Mixtures of the two containing as little as 10 percent tap water caused as pronounced germination delay as pure tap water. A relatively short period in tap water, followed by transfer to distilled water, also resulted in definite retardation. High alkalinity of the tap water and its ionic constitution are both considered as possible causes, but the data obtained indicate that it was the calcium present rather than the alkalinity per se which was responsible.

No conclusive explanation is offered as to the mechanism of these calcium effects, but the results suggest that the permeability of the seed coat to water becomes altered.

Effect of alternate moistening and drying on germination of seeds of western range plants, S. M. GRISWOLD (*Bot. Gaz., 98 (1936), No. 2, pp. 243–269, figs. 9*).—The seeds used comprised 9 grass, 26 weed, and 7 woody species of Utah range plants, of which 23 gave little or no germination at 22°–29° C.

The effect of alternate moistening and drying varied with the species. Of the 19 species germinating at 22°–29°, such treatment had little effect on the germination of *Bromus polyanthus*, accelerated that of *Stipa lettermani*, *Artemisia incompta*, *Lepidium densiflorum*, and *Plantago tweedyi*, and decreased that of *Geranium viscosissimum*, *Pseudocymopterus montanus*, *Chrysothamnus lanceolatus*, and *S. columbiana*. Rapid drying affected but little the germination of *Poa interior*, *P. secunda*, and *Chenopodium album*, but increased that of *Achillea lanulosa*, *Androsace diffusa*, *Pentstemon rydbergii*, and *Rumex mexicanus*. In all these species slow drying lowered the germination percentage. Rapid drying decreased the germination of *B. anomalus*, *Lupinus parviflorus*, and *Rudbeckia occidentalis*, while slow drying increased it in *Rudbeckia* but had little effect in *B. anomalus* or *Lupinus*. Increased germination was usually accompanied by a hastening of the germinative process and decreased germination by a retardation. However, in *Poa secunda* (No. 1), *Androsace*, *Plantago*, *Rudbeckia*, and *Rumex*, retardation was followed by increased germination.

Some seeds, after water absorption, withstood short periods of alternate drying and moistening and others withstood long periods of drying without injury. The time at which drying begins in relation to the stage of development of the germinating seed is a very important factor for determining whether drying is harmful or beneficial. The effect of drying is also influenced by its rate.

Researches on the ascent of sap [trans. title], L. HAUMAN (*Acad. Roy. Belg., Cl. Sci. Mém., 12 (1934), No. 7, pp. 83, figs. 5*).—The discussions in this monograph center around the entry of air into the vessels, the role of living cells, the nature of the forces concerned in the ascent of sap (gravity, osmosis, and imbibition), and extravascular circulation. A bibliography of 28 titles and a list of the 60 plant species, varieties, and forms used in the investigation are included.

The physico-chemical properties of plant saps in relation to phytogeography: Data on native vegetation in its natural environment, J. A. HARRIS (*Minneapolis: Univ. Minn. Press, [1934], pp. VI+339*).—This volume was compiled from original records and edited by a committee of the author's colleagues in the University of Minnesota, comprising G. O. Burr, R. A. Gortner, and C. O. Rosendahl (chairman).

Part 1, papers on the physicochemical properties of plant saps in relation to phytogeography, includes the following: Physical chemistry in the service of phytogeography, and the physicochemical properties of plant tissue fluids—their significance in physiology, phytogeography, and organic evolution, both by Harris, with accompanying memoranda giving a partial list of habitats for which extensive series of physicochemical determinations of plant fluids are already available, physiological and chemical investigations already under way, genetic phases of the investigation already under way, and a bibliography of published papers on the physicochemical properties of plant tissue fluids; and the importance of phytochemical studies in the field of plant geography, by H. L. Shantz. Part 2, experimental data on the physicochemical properties

explanation of the code used in the tabulations, and the presentation of detailed data for the western United States and the Hawaiian Islands and for the eastern United States and Jamaica. Part 3, descriptions of stations at which specimens were collected, includes the common names used and their botanical equivalents, and a presentation of detailed data for the western United States and the Hawaiian Islands and for the eastern United States and Jamaica.

An index to the experimental data is provided.

The influence of cell-wall composition on the physical properties of beech wood (Fagus sylvatica L.), S. H. Clarke (*Forestry, 10 (1936), No. 2, pp. 143–148, pl. 1, fig. 1*).—Under certain conditions the fiber walls of beech and many other hardwoods develop peculiar thickenings called "gelatinous layers" or "tertiary walls." It is shown that samples with large proportions of these abnormal thickenings usually have low strength values in compression parallel to the grain, and that the wall composition is apparently more important than specific gravity in influencing strength. It is also shown that cell-wall composition is capable of influencing the shrinkage and working properties of beech.

The literature of mycorrhizae: A compendium of our knowledge of fungus roots, A. P. Kelley (*Landenberg, Pa.: Landenberg Lab., 1937, pp. 306*).—This mimeographed work presents digests of the mycorhizal literature of the world, arranged alphabetically by authors. The general index provided does not include "hosts" or fungi.

Longevity of legume bacteria (Rhizobium) in water, W. A. Albrecht and T. M. McCalla (*Jour. Amer. Soc. Agron., 29 (1937), No. 1, pp. 76–79*).—The results of this study at the Missouri Experiment Station suggest that apprehension regarding the rapid destruction of *Rhizobium* cultures in tap water in closed containers is unwarranted, and that failures in tap water transfer of cultures can scarcely be ascribed to the water treatment. Since tap water is actually an aqueous extract, the results appear to indicate that even in such a dilute mineral solution of the soil, with its consequent low oxygen content, the legume bacteria maintain themselves for a long time in the absence of the host.

GENETICS

A portable chamber for treating plants with heat, R. A. Brink (*Jour. Amer. Soc. Agron., 28 (1936), No. 12, pp. 1021, 1022*).—Using the apparatus described, S. Atwood, working on *Melilotus alba* in the author's laboratory at the Wisconsin Experiment Station, obtained one tetraploid plant with $2n = 32$ chromosomes and one aneuploid individual with $2n = 24$ chromosomes from 575 seeds treated in the early embryonic stages.

Tetraploid and aneuploid Melilotus alba resulting from heat treatment, S. Atwood (*Amer. Jour. Bot., 23 (1936), No. 10, pp. 674–677, figs. 17*).—Biennial *M. alba* was subjected at the Wisconsin Experiment Station to heat treatment at the time of the division of the zygote and proembryo. In a population treated at from 40° to 41° C. for 30 min. one tetraploid ($n = 16$, $2n = 32$) was found. It formed quadrivalents, but the chromosomes segregated regularly in meiosis and it was almost completely self-fertile. In a population treated at from 38° to 40° for 20 min. an aneuploid ($n = 12$, $2n = 24$) was found. This formed some quadrivalents at meiosis and showed only occasional irregular distributions, but was only slightly self-fertile.

Genetic effects of ultra-violet radiation in maize, I–III, L. J. Stadler and G. F. Sprague (*Natl. Acad. Sci. Proc., 22 (1936), No. 10, pp. 572–591*).—These contributions are presented from the U. S. Department of Agriculture and the Missouri Experiment Station, working in cooperation.

I. *Unfiltered radiation* (pp. 572–578).—Ultraviolet radiation applied to corn pollen increased greatly the frequency of both entire and fractional endosperm deficiencies. Deficiencies affecting the F_1 plants also were induced by the treatment and many were haplo-viable. No significant increase was noted in the frequency of translocation. Several of the numerous point mutations affecting seed and seedling characters induced occurred in treated germ cells in which apparently unrelated mutations or other germinal alterations also took place.

II. *Filtered radiations* (pp. 579–583).—Results with filtered radiations applied to corn pollen indicate that λ3130 and longer wave lengths are relatively ineffective in inducing deficiency, and that λ3022 and shorter wave lengths are effective, λ3022 probably being less effective than shorter wave lengths. Although radiation of effective wave length sometimes is present in low intensity in sunlight, the occurrence of various genetic alterations in the controls (shielded from sunlight) showed that exposure of the pollen to sunlight is not the sole cause of naturally occurring deficiencies and mutations. The frequency of entire endosperm deficiencies of *A* and *Pr* induced by the ultraviolet radiations applied was about equal, while the frequency of induced fractional endosperm deficiencies was much higher for *A* than for *Pr*. The frequency of germless seeds induced by the ultraviolet radiations applied was low, and decreased with decreasing relative intensity of the shorter wave lengths.

III. Effects of nearly monochromatic λ2537, and comparison of effects of X-ray and ultra-violet treatment (pp. 584–591).—Comparable trials of mercury discharge tube radiation (largely λ2537) and filtered mercury arc radiations (largely λ2967 and λ3022 plus various genetically ineffective wave lengths) indicated that the relative frequency of induced deficiency at the various loci tested does not differ appreciably for the longer and shorter wave lengths. The maximum dose tolerated is much lower for the shorter wave length. The frequency of induced deficiency per unit of energy applied at the surface of the pollen grain is much higher for the shorter wave length. The difference between the wave lengths compared in effect on the frequency of germless seeds is even more extreme. Comparing doses which induced deficiency in approximately equal frequencies, the shorter wave length radiation produced several times as many germless seeds as the longer wave length radiation.

Comparable trials of X-rays (1333 r) and filtered mercury arc radiations (various doses) indicated that almost all X-ray-induced deficiencies affect the endosperm as a whole, while a large proportion of ultraviolet-induced deficiencies are fractionals affecting approximately half of the endosperm. The frequency of entire endosperm deficiencies of *A* was much higher than that of *Pr* following X-ray treatment, but *A* and *Pr* deficiencies were about equally frequent following ultraviolet treatment. The frequency of germless seeds produced by X-rayed pollen exceeded that produced by ultraviolet-treated pollen. Additional contrasts between ultraviolet and X-ray effects indicated by the experiments but not yet tested in strictly comparable trials are listed.

Hybrid vigor and growth rates in a maize cross and its reciprocal, G. F. Sprague (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 11, pp. 819–830, figs. 3*).—The growth rates of later generations of the two inbred strains of corn (228–4–8, 228–6–5) used by Ashby (E. S. R., 68, p. 602) and their reciprocal hybrids were studied cooperatively by the U. S. Department of Agriculture and the Missouri Experiment Station.

By dividing the growth period from fertilization to maturity of the corn plant into three phases—(1) from fertilization to maturity of seed, (2) from germination through the early seedling stage, and (3) from the late seedling

stage to maturity—it was shown that the hybrids grew faster than either parent during the first two phases of growth. Differences in the growth rate during the third period were not established statistically because of large sampling errors. In the first two phases the inheritance of growth rate could not be ascribed to a complex from one parent only; the rate must represent the action, complementary or additive, of factors from both parents. The reciprocal hybrids were alike in growth rates and in total amounts of growth. Within a genotype, embryo weights were found of little importance in determining final weight, since initial differences in embryo weight failed to persist. Hybrid vigor could not be attributed to the maintenance of an initial difference in embryo size. The differing growth rates for the three phases of growth, the author concludes, are readily explained on the basis of the complementary action of dominant genes.

Kindred work of Ashby and of Lindstrom (E. S. R., 73, p. 764) is discussed briefly.

Differential fertilization in the Bt Pr linkage group of maize, C. R. Burnham (*Jour. Amer. Soc. Agron., 28 (1936), No. 12, pp. 968–975*).—Data presented in this contribution from the West Virginia Experiment Station indicated that a gene closely linked to *bt* acts upon the pollen of heterozygous corn plants in such a way that relatively large deficiencies for one allelomorph result. The *Ga* allelomorph must either produce something which speeds ups germination or growth of pollen tubes carrying this allelomorph, or something which retards those carrying *ga*. Evidence that this gene must be considered as a dominant and that it acts as a differential in the pollen only when the silks carry the gamete gene is presented. Results from selfs and reciprocal backcrosses of plants heterozygous for *bt* and carrying the disturbing factor indicated that the deviations in the selfed ears were not due to the presence of a linked egg or pollen lethal. Examination of the pollen showed that certain lines were partially sterile, but indicated no relation to the deficient ratios.

Comparison of ratios given by *Bt* non-cross-overs and by *Bt* cross-overs between the *pr* and *bt* loci indicated that a second such gamete gene may be present in certain stocks. The first gene, Ga_3, is closely linked with *bt*, but the data conflict as to the side of *bt* on which it is located. The second gene appeared to be nearer to *pr*. In the case described by Emerson (E. S. R., 70, p. 757), Ga_1 was relatively loosely linked with *su* (30.9 percent recombination), but only a small percentage of *ga* pollen was effective. In the present case there is close linkage with *bt*, but ga_3 pollen functions to a much greater extent, the ratios resulting from selfing heterozygous plants depending largely on pollen tube germination or growth.

A second-chromosome gene, Y_3, producing yellow endosperm color in maize, H. S. Perry and G. F. Sprague (*Jour. Amer. Soc. Agron., 28 (1936), No. 12, pp. 990–996*).—Yellow endosperm coloration in corn was observed to depend upon the interaction of the dominant allelomorphs of y_1 and y_3. Genetic tests indicated that Y_3 is closely linked with *al*, a chlorophyll deficiency type termed albescent. Trisomic tests showed both *al* and y_3 to belong in the second linkage group, and both appeared to be near lg_1 within the chromosome.

Genotypic control of chromosome size, P. T. Thomas (*Nature [London], 138 (1936), No. 3488, p. 402, fig. 1*).—The occurrence of chromosomes of double normal size in a male sterile specimen of perennial ryegrass (*Lolium perenne*) is described. Indications were that chromosome size is subject to Mendelian segregation.

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Cytogenetic notes on cotton and cotton relatives, II, J. M. WEBBER (*Science, 84 (1936), No. 2182, p. 378*).—Additional cytological studies (E. S. R., 72, p. 461), made on a number of F_1 hybrids between different cottons, showed that the "chromosome complement at the reduction division is generally composed of: (1) Thirteen pairs of hybrids between cultivated Asiatic species and *Gossypium anomalum*, and in hybrids between wild American species and *Thurberia thespesioides*; (2) 13 pairs and 13 single chromosomes in hybrids between cultivated American species and *T. thespesioides*, and in hybrids between cultivated American species and *Gossypium anomalum*; (3) from 0 to 8 pairs with from 10 to 26 single chromosomes in hybrids between cultivated Asiatic species and *G. stocksii*, and between cultivated Asiatic species and *G. sturtii*; (4) 26 single chromosomes in hybrids between cultivated Asiatic species and *Thurberia thespesioides*." These findings seemed to support Skovsted's assumption (E. S. R., 71, p. 457) that the cultivated American cottons were derived from a cross between a wild American species and a species having a chromosome complement similar to that of the cultivated Asiatic cottons. The view that *T. thespesioides* is congeneric with *Gossypium* also was strongly supported. See also another note (E. S. R., 75, p. 189).

The occurrence of striped-leaved plants from a cross between two varieties of oats, H. H. LOVE and W. T. CRAIG (*Jour. Amer. Soc. Agron., 28 (1936), No. 12, pp. 1005–1011, figs. 2*).—The behavior of striping as found in plants from a cross between Ruakura oats and a strain of *Avena sterilis macrocarpa* was studied at Cornell University in cooperation with the U. S. Department of Agriculture. Occurrence of 17 striped plants out of a total of 386 plants in the F_2 generation suggested an approach to a 15:1 ratio, but later results obtained from the F_3 generation proved otherwise. Further results from crosses in which striped plants were pollinated with pollen from fully green plants and also from the reciprocal crosses showed that the behavior of the chlorophyll deficiency is apparently cytoplasmic in nature and not to be explained as due to the chromosomes.

An anthocyanin inhibitor in rice, B. S. KADAM (*Jour. Heredity, 27 (1936), No. 10, pp. 405–408*).—An anthocyanin gene, *A*, produces pigment all over the rice plant, making the plants entirely purple. Its action is limited by a partially inhibiting gene, *I*, which suppresses color in the leaf region but allows development of pigment in other parts.

A developmental analysis of inherited shape differences in cucurbit fruits, E. W. SINNOTT (*Amer. Nat., 70 (1936), No. 728, pp. 245–254, figs. 4*).—The author distinguishes four distinct types of shape determination in cucurbits and states that all four are independent of each other in inheritance. The genes that control these shapes evidently differ in the time that the major effect is produced and in the character of the effect itself. Practically nothing is known at present as to the developmental mechanisms concerned in any of the four types of shape determination.

Chromosome structure in Tradescantiae.—VII, Further observations on the direction of coiling in Tradescantia reflexa Raf., B. R. NEBEL and M. L. RUTTLE (*Amer. Nat., 70 (1936), No. 728, pp. 226–236*).—In this contribution from the New York State Experiment Station, the authors summarize as follows: "In an X-rayed strain of *T. reflexa* showing rings or chains of two, four, and six chromosomes, respectively, serial observations indicate that the direction of coiling tends to fall into certain patterns within a given half-anther. These patterns do not necessarily belong to given chromosomes or parts of chromosomes but appear to belong to a given group of chromosomes. Random coiling is thus considered to be modified within an anther. Similarity of patterning between half-anthers is suggested, but over a long period and

with a sufficient number of observations the various patterns between different anthers may form a random series."

Chromosome structure.—IX, Tradescantia reflexa and Trillium erectum, B. R. NEBEL and M. L. RUTTLE (*Amer. Jour. Bot., 23 (1936), No. 10, pp. 652–663, figs.,* [*24*]).—This is a contribution from the New York State Experiment Station.

New results of twinning investigations in cattle, C. KRONACHER and D. SANDERS (*Neue Ergebnisse der Zwillingsforschung beim Rind. Berlin: Paul Parey, 1936, pp. 172, figs. 233*).—The author describes the similarity found in the morphological characteristics, including body measurements of several pairs of supposedly single-egg twins in cattle.

New data about the chromosome number in domestic sheep, G. M. PCHAKADZE (*Compt. Rend* (*Dok.*) *Acad. Sci. U. R. S. S., n. ser., 3 (1936), No. 7, pp. 333, 334, fig. 1*).—The diploid chromosome number for Georgian fat-tailed sheep was found to be 60, in studies at the Ukrainian Academy. A footnote states that N. Butarin also found this number in an arkhar, fat-rumped ram and the F_1 hybrids.

The genetics of the Wensleydale breed of sheep.—II, Colour, fertility, and intensity of selection, F. W. DRY (*Jour. Genet., 33 (1936), No. 1, pp. 123–134*).—Further studies are reported on the inheritance of color in Wensleydale sheep (E. S. R., 52, p. 332). These sheep are white, black, or silver-gray, although blacks have never been allowed to breed. The deep blue color in the ears of white sheep was indicative of the heterozygous condition, as was the pale color in the ears indicative of homozygotes. Evidently, selection was generally for heterozygous ewes. An analysis of the fertility in the single flock showed that it was very high, production being 1.71 lambs per ewe among 1,623 ewes which were mated. In breed crosses, the high fertility of the Wensleydale was transmitted by rams to their daughters. On account of the color standard for the breed, selection of breeding animals is severely limited.

The incidence of kemp in the fleece of Scottish Mountain Blackface sheep, with special reference to inheritance, D. M. BRYANT (*Empire Jour. Expt. Agr., 4 (1936), No. 14, pp. 165–185, pls. 2, figs. 11*).—The results obtained in this study at the University of Edinburgh give evidence that the incidence of kemp fibers in the fleece of Scottish Mountain Blackface sheep is an inherited character. An analysis of the percentage of kemp in the fleece of the rams, ewes, and the resulting offspring in 57 matings indicates that neither the nonkempy condition nor the grossly kempy condition behave as a Mendelian dominant, the inheritance being of an intermediate type. There is some evidence, however, that a low degree of kempiness shows partial or incomplete dominance over the varying higher degrees of kempiness. On this basis a plan is outlined for reducing the incidence of kempy fleece by selecting nonkempy breeding rams and careful culling of kempy progeny from the breeding flock.

Sheep—the development of a no-tailed breed, J. W. WILSON (*South Dakota Sta. Rpt. 1936, pp. 12, 13*).—Results are reported on the progress in the development of the no-tailed breed of sheep and the characteristics of the progeny produced in crosses of the no-tailed sheep with Southdowns.

Hair color in hunting dogs and its genetic relation to nose and iris pigment [trans. title], A. L. v. STEIGER (*Züchter, 8 (1936), No. 10, pp. 261–271*).—The author presents an analysis of color inheritance in cocker spaniels, pointers, and setters, calling attention to the genes *B* (black), *E* (extension of black pigment), and a multiple allelomorphic series of intensity modifiers *M*, (*m*), ((*m*)), (((*m*))), and ((((*m*)))). There were also factors *F* for dark eyes and black nose linked with the extension factor. The effects of combina-

tions of these factors on coat, nose, and eye color are presented. A recessive dilution factor (*Z*) was also postulated.

Siamese-Persian cats, C. E. Keeler and V. Cobb (*Jour. Heredity, 27 (1936), No. 9, pp. 339, 340, fig. 1*).—Three Siamese-Persian cats were produced by mating an F_2 black, long-haired female, from a cross with a Persion × Siam, to her short-haired sire (F_1).

Further linkage data on the albino chromosome of the house-mouse, H. Grüneberg (*Jour. Genet., 33 (1936), No. 2, pp. 255–265*).—Continuing studies of linkage of the genes for shaker, albinism, and pink-eye dilution in the mouse (E. S. R., 75, p. 468), additional data brought the total number of back-cross progeny that have been produced to 3,692. An analysis of these data showed that crossing-over was less frequent in males than in females, and there were slight differences between the coupling and repulsion phases. Combination of the literature and the author's experiments gave the cross-over values for females between the genes in coupling as *sh–c* 4.43±0.35, *c–p* 17.61±0.70, and for repulsion *sh–c* 3.13±0.52, *c–p* 15.16±0.77. The cross-over values between these characters in males were 3.63±0.65, 12.04±0.87, 1.67±0.68, and 12.58±0.77 in the respective classes. Age of the parents had no effect on cross-over values but evidence of interference was presented.

Grizzle, a color character of the black rat, H. W. Feldman (*Amer. Nat., 70 (1936), No. 730, pp. 502–504*).—A description is given of the appearance of a character involving the appearance of white hairs interspersed with the colored ones in the pelage producing a silvering in the black rat, *Rattus rattus rattus*. The time of appearance of this character was variable, ranging from 7.1 to 17.8 mo. with an average of 14.2 mo. of age. Crosses of grizzled animals with normals produced 108 progeny, all normal, but of the 223 rats in the F_2s, 50 became grizzled before the age of 18 mo., suggesting that the character is recessive to the normal. The condition was variable in its extent and age of inception.

Heterogeny in the axial skeleton of the creeper fowl, I. M. Lerner (*Amer. Nat., 70 (1936), No. 731, pp. 595–598*).—The heterogenic constituents *b* and *k* for normal and creeper fowls in the formula $y=bx^k$ expressing growth of a part in relation to the whole body are presented by the California Experiment Station. The ratio for log *b* of normals and creepers was shown to grade regularly from proximal to distal. The study was based on Landauer's data (E. S. R., 71, p. 615).

Abnormal upper mandible, a new lethal mutation in the domestic fowl, V. S. Asmundson (*Jour. Heredity, 27 (1936), No. 10, pp. 401–404, figs. 2*).—An eighth lethal factor in the fowl involving abnormal maxillae of the upper mandible and associated conditions is described by the California Experiment Station. Few of the affected birds were able to pip the shell, and only one hatched. The condition appeared among the progeny of one hen, and about one-half of her normal daughters were carriers. As there was no significant departure from the normal in the sex ratio of the lethal chicks and there were produced 58 abnormals to 173 normals, the condition is evidently due to a recessive autosomal gene. Attention is called to the occasional appearance of a similar abnormality in pheasants, partridges, and turkeys.

Endocrine weights of the Bantam fowl, S. L. Leonard and J. W. Righter (*Jour. Heredity, 27 (1936), No. 9, pp. 363–366*).—Comparison of the weights of the hypophysis, thyroids, parathyroids, adrenals, spleen, and testes of 14 adult male and 14 adult female Bantams with the weights of these organs from Leghorn fowls showed that per unit of body weight the hypophyses of the Bantams were distinctly heavier, the thyroids lighter, and the adrenals about the same

as those of the Leghorns. No sex differences were observed in the size of the endocrine glands.

Further purification of galactin, the lactogenic hormone, W. H. McShan and C. W. Turner (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 9, pp. 1655, 1656*).—A description is given by the Missouri Experiment Station of a method by which a tenfold concentration of the lactogenic hormone from the anterior pituitary is brought about. The product brings about active proliferation of the crop gland in pigeons.

Absence of follicle-stimulating hormone in pituitaries of young pigeons, O. Riddle and J. P. Schooley (*Soc. Expt. Biol. and Med. Proc., 32 (1935), No. 9, pp. 1610–1614*).—The testes of immature ringdoves were increased in size 100 and 300 percent, respectively, by the implantation of one rat pituitary daily for 10 days. Adult pigeon pituitaries produced a greater response but no detectable stimulation followed the implantation of as many as three pituitaries from immature pigeons daily for 10 days. These results substantiate the indication that the slow growth of the testes of pigeons immediately after hatching is due to the failure of the pituitaries of the young pigeon to secrete any of the follicle-stimulating hormone.

Voluntary control of sex by hormone injections.—I, Inversion of sex in the genetic male embryo [trans. title], V. Dantchakoff (*Bul. Biol. France et Belg., 70 (1936), No. 3, pp. 241–307, figs. 5*).—Injections of folliculin into the embryos of fowls at four days of incubation were found to modify the gonads of males so that they showed female characteristics. It required about three days or more for the effects of the hormone to become evident. In general, the hormone caused proliferation of the left gonad, formation of ovarian tissue, and marked delevopment of the oviduct on the left side as contrasted with the vas deferens on the right side.

Investigation of the treatment of fertility disorders in sheep [trans. title], J. Langlet and M. Steffens (*Züchtungskunde, 11 (1936, No. 8, pp 312–322)*).—Favorable results are reported in bringing ewes which failed to breed into heat following the regular breeding season by the use of prolan, unden, and provetan, commercial preparations of the oestrus-producing hormone of the ovary. Lambs were produced by many of the ewes. Yohimbin and germinated rye were also tested.

An experiment in eutelegenesis, A. Walton and R. Prawochenski (*Jour. Heredity, 27 (1936), No. 9, pp. 341–344, fig. 1*).—An account is given of the airmail shipment of semen collected from a Suffolk ram by the use of an artificial vagina, at the School of Agriculture, Cambridge, England, to the Jagellonian University, Kraków, Poland, where five Polish ewes were artificially inseminated. Two ewes conceived but one aborted. One lamb was born alive from semen kept alive for four days for its use in artificial insemination.

FIELD CROPS

[Field crops research in Florida] (*Florida Sta. Rpt. 1936, pp, 36–41, 42–46, 59, 121, 122, 123, 127, 129–134, 138, 144, 146, 147, 151, 152, 156–158, fig. 1*).—Agronomic investigations (E. S. R., 75, p. 615) at the station and substations, progress for which is reported as carried on by F. H. Hull, W. A. Carver, W. E. Stokes, G. E. Ritchey, W. A. Leukel, J. P. Camp, J. H. Jefferies, R. M. Barnette, J. D. Warner, A. L. Shealy, R. W. Ruprecht, A. Daane, R. E. Robertson, F. D. Stevens, T. Bregger, J. R. Neller, R. R. Kincaid, W. M. Fifield, and W. F. Ward, were concerned with breeding work with corn, oats, Napier grass, pigeonpeas, sugarcane, and peanuts; variety tests with corn, oats, grain sorghum, sorgo, sugarcane, potatoes (also seed sources), cowpeas, soybeans, alfalfa, and mis-

cellaneous forage and pasture grasses and legumes and cover crops; production tests with ramie and seed and fiber flax; fertilizer tests with corn, oats, potatoes, chufas, sugarcane, shallu, Dallis grass, and Napier grass; response of potatoes and corn to zinc; green manure studies; study of the development and deterioration of roots in relation to growth of pasture plants under different fertilizer and cutting treatments; effects of different rates and carriers of nitrogen on pasture grasses; interplanting of corn varieties with velvetbeans; rate of planting and stage of cutting tests with *Crotalaria intermedia;* relation of organic composition of crops, e. g., sugarcane, grasses, and forage legumes, to growth and maturity; composition factors affecting the value of sugarcane for forage and other purposes; physiology of the blooming of sugarcane; cultural tests with potatoes, alfalfa, corn, sugarcane, and chufas; preliminary stack silo experiments with surplus sugarcane; comparative production of silage crops, including pearl millet, sorgo, Napier grass, and Cayana sugarcane when grown at relatively high fertility levels; cutting tests with grasses; seed storage investigations; methods of producing seed in the field, germination of seed after 4 yr. in different types of storage, and plant-bed fertilization, all with tobacco; cowpeas and sorghum grown in rotations for summer cover and green manure; and crop rotation studies with corn, cotton, crotalaria, and Austrian winter peas. Pasture studies in addition to those mentioned above included effects of different fertilizer formulas on yields of pasture grasses; comparisons of native v. improved and burned v. unburned native pastures and of methods of planting centipede grass; effect of burning on growth and relative composition of range grasses; and pasture studies on peat and muck soils. Several lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crops experiments at the Georgia Coastal Plain Station, 1935] (*Georgia Coastal Plain Sta. Bul. 26 (1936), pp. 11–38, 62–64, 92–96*).—Field crops work (E. S. R., 75, p. 194) reviewed for 1935 and for various periods of years included variety tests with cotton, corn for yield and resistance to weevils, oats, wheat, rye, grain sorghum, sorgo, tobacco, peanuts, lespedeza, soybeans for feed and forage, cowpeas, velvetbeans, crotalaria, pasture grasses, and miscellaneous summer forage crops; breeding work with oats, peanuts, soybeans, and pasture grasses; fertilizer experiments with cotton, corn, oats, peanuts, velvetbeans, lespedeza, sweetpotatoes, and tobacco; winter cover crops for cotton and corn; and cultural (including planting) experiments with oats, wheat, peanuts, annual lespedeza and *Lespedeza sericea*, soybeans, crotalaria, and tobacco. Besides the results of fertilizer experiments with cotton and tobacco concerned with formulas, rates of applications, carriers of nitrogen, potassium, phosphorus, and placement, significant data are reported from tests of sodium nitrate and potassium for top dressing of cotton, and plant bed management studies and tests of magnesium sources and animal manures, all with tobacco. Several lines of research were in cooperation with the Georgia Experiment Station and the U. S. Department of Agriculture.

[Field crops experiments in Oklahoma, 1934–36], G. F. GRAY, E. F. BURK, J. E. WEBSTER, H. J. HARPER, H. F. MURPHY, L. L. LIGON, W. B. GERNERT, and J. C. IRELAND (*Oklahoma Sta. [Bien.] Rpt. 1935–36, pp. 55, 56, 59, 60, 62, 63, 71, 104–117, 119, 120, figs. 5*).—Experimentation with field crops (E. S. R., 73, p. 32), reported on briefly for the above period, included variety tests with cotton, corn, popcorn (seed sources), grain sorghum, sorgo, potatoes, sweetpotatoes, alfalfa, lespedeza, cowpeas, soybeans, vetch and winter peas, miscellaneous grasses, and clovers; breeding work with cotton, corn, grain sorghum, sweetpotatoes, buffalo grass, and alfalfa; cultural (including planting)

experiments with cotton, grain sorghum, sorgo, winter peas and vetch, sweetclover, and other legumes; fertilizer trials with alfalfa, vetch, and potatoes; response of alfalfa to farm manure; causes of failures of legume crops; effect of seed treatments and soil conditions on yields of fall-crop potatoes; composition of soybeans; and adaptation studies with pasture grasses and legumes.

[Field crops work in Pennsylvania], D. E. HALEY, J. J. THOMAS, C. F. NOLL, C. J. IRVIN, H. B. MUSSER, F. D. GARDNER, S. I. BECHDEL, O. OLSON, J. A. SPERRY, and M. H. KNUTSEN (*Pennsylvania Sta. Bul. 336 (1936), pp. 4, 12, 15, 19, 20, 21, 22, 23, fig. 1*).—Agronomic research reported on briefly, certain features of which were in cooperation with the U. S. Department of Agriculture, included breeding work with soybeans and tobacco; variety trials with wheat, oats, barley, soybeans, tobacco, and alfalfa; curing tests with crushed alfalfa and soybeans for hay; determination of the potassium content of tobacco; fertilizer experiments with tobacco and pasture grasses; soil acidity tolerance of red clover strains; and tobacco rotations.

[Field crops research in South Carolina], H. P. COOPER, R. L. SMITH, G. B. KILLINGER, G. M. ARMSTRONG, C. C. BENNETT, B. S. HAWKINS, N. A. SCHAPPELLE, C. H. HOLLIS, C. S. PATRICK, E. D. KYZER, J. E. LOVE, T. M. CLYBURN, J. H. MITCHELL, W. H. JENKINS, E. E. HALL, F. M. HARRELL, W. M. LUNN, H. A. MCGEE, R. W. WALLACE, N. MCKAIG, JR., W. A. CARNS, and E. W. FAIRES (*South Carolina Sta. Rpt. 1936, pp. 19, 20, 28–33, 62, 65–69, 72–85, 93, 94–100, 107–115, 119–126, figs. 16*).—Agronomic experiments (E. S. R., 75, p. 37), reported on briefly from the station and substations (in certain lines in cooperation with the U. S. Department of Agriculture), included variety tests with cotton, corn, oats, wheat, soybeans, crotalaria, and miscellaneous pasture grasses and legumes; breeding work and genetic studies with cotton; hybridization experiments with sea-island cotton; fertilizer and nutrition studies with cotton comprising placement, time and rate of applying potassium fertilizers, trials of nitrogen carriers for side dressing; yields of seed cotton from use of calcium nitrate v. sodium nitrate and sodium chloride v. potassium chloride; tests of brands of sodium nitrate; the effect of magnesium in the mineral nutrition of the cotton plant; yields of seed cotton from the use of acid and nonacid fertilizers; effect of additions of sodium in the fertilizer on the yields of cotton; residual effects of potash on cotton; effects of winter legume cover crops on cotton following, with and without sodium nitrate applications, and manure v. green manure; seed treatments, and studies of variation in fiber length, fineness, and maturity in several cotton varieties; tobacco investigations, including trials of fertilizer mixtures and placement, fertilization of plant beds, effects of natural weed fallow of several common weeds on yield and quality, study of effects of fertilizers high and low in sulfur, and fertilizer formulas again recommended for bright flue-cured tobacco and plant beds; a spacing test with cotton; adaptation and propagation of pasture grasses; fertilization of carpet grass pasture and reestablishment of lespedeza in the sod; effects of superphosphate, basic slag, and potash on the growth and mineral content of carpet grass; and a grazing experiment to determine the combination of annual crops to provide pasture throughout the year for dairy cows in milk.

[Agronomic research in South Dakota], A. N. HUME and N. E. HANSEN (*South Dakota Sta. Rpt. 1936, pp. 9, 10, 32, 33*).—Field crops investigations (E. S. R., 75, p. 617), including breeding work with corn, spring and winter wheats, and barley; crop rotations for bindweed control; and tests of perennial wheat are reviewed briefly.

[Field crops research in Utah], R. J. Evans, R. W. Woodward, D. C. Tingey, D. W. Pittman, J. W. Carlson, G. Whornham, A. F. Bracken, J. E. Greaves, R. J. Becraft, L. A. Stoddart, and B. Maguire (*Utah Sta. Bul. 276 (1936), pp. 1–6, 33, 34, 46–48, 63–68, figs. 9*).—Further progress is reported from agronomic experiments (E. S. R., 72, p. 316) at the station and substations for the biennium ended June 30, 1936, comprising variety tests with spring and winter wheat, oats, corn, alfalfa, soybeans, and miscellaneous forage grasses; breeding work with barley, wheat, and alfalfa; cultural tests with sugar beets and soybeans; seed production studies with alfalfa (E. S. R., 74, p. 478; 75, p. 333); comparative tests of leading varieties of barley, wheat, oats, and corn for livestock feed (E. S. R., 74, p. 626); wheat experiments on dry land concerned with varieties, tillage, and cultural practices, type of plowing, manuring and green manuring, stubble burning, cropping systems, and nutritive value (high v. low calcium and phosphorus content) and mineral content of different wheat varieties; range investigations, including collection of range plant species and maintenance of the Intermountain Herbarium, adaptation studies, tests of fall, winter, and spring cuttings of native species for erosion control, and observation on depreciation of ranges by excessive grazing and water and wind erosion; and studies dealing with losses due to weeds, manure as a carrier of weed seed (E. S. R., 71, p. 773), longevity of weed seeds, and tillage and other weed control measures. Certain phases of the research were in cooperation with the U. S. Department of Agriculture.

[Agronomic experiments in Wyoming] (*Wyoming Sta. Rpt. 1936, pp. 3, 4, 18–21, 22, 23, 24–26, 27, 28, 29*).—Experiments with field crops (E. S. R., 75, p. 38) at the station and substations, for which progress results are reported, included variety tests with winter and spring wheat, oats, barley, corn, potatoes, alfalfa, and miscellaneous forage grasses and mixtures; cultural (including planting) experiments with winter and spring wheat, barley, oats, corn, crested wheatgrass, bromegrass, and alfalfa; fertilizer trials with alfalfa and sugar beets; a test of barley as a nurse crop for alfalfa; crop rotations and methods of preparing seedbeds; effects of a shelter belt on increasing crop yields inside of the protected areas; an irrigation test with Jerusalem-artichokes; pasture studies; and control of whitetop and Canada thistles. A number of lines of work were in cooperation with the U. S. Department of Agriculture.

[The progress of field crops work at Wyoming State experiment farms] (*Wyoming Sta. Bul. 219 (1937), pp. 5–16, 19, 20, 22–24, 27–33, 34–36, 37–39, 40–43, 44, 45, fig. 1*).—Progress results are reported from agronomic activities on the experiment farms near Cheyenne, Eden, Gillette, Afton, Lander, Lyman, Sheridan, Torrington, and Worland, including variety tests with oats, barley, wheat, corn, alfalfa for yield and wilt resistance, soybeans, sugar beets, and annual forage crops and grasses; trials of pasture grasses and mixtures; comparisons of certified potato seed grown for 1 and 2 yr. under irrigation; cultural (including planting) tests with corn, winter wheat, spring wheat, oats and barley, alfalfa, potatoes, and sugar beets; fertilizer trials with oats, alfalfa, potatoes, and sugar beets; effect of manure on nonirrigated crops of corn, potatoes, beans, spring wheat and alfalfa; crop rotations; the effect of tillage on crop yields in a rotation including corn, spring wheat, and oats; renovation of permanent pastures and alfalfa fields; and the control of quackgrass and whitetop. Several lines of work were in cooperation with the U. S. Department of Agriculture.

Grassland management, D. S. Fink (*Maine Sta. Bul. 384 (1936), pp. 402–405, fig. 1*).—The response of permanent pasture to various fertilizer combinations and lime and of timothy meadows to fertilizers is reported on briefly.

The effect of exposure in the field on grade, strength, and color of raw cotton, M. A. GRIMES (*Texas Sta. Bul. 538 (1936), pp. 35, figs. 17*).—Ferguson Triumph 406 cotton grown in 1931 and 1932 at Temple, Chillicothe, and Lubbock, was picked after opening and after intervals of exposure ranging from 1 to 33 weeks; and after ginning, and classing (by J. G. Powers), strength determinations, and color analyses were made.

A drop of one grade had occurred after 1 week of exposure at one station and after an average of less than 4 weeks for all stations and seasons. A drop of 4 and 5 grades, a decrease of from 1/16 to 3/16 in. in length, and a decrease in price of from 150 to 265 points occurred during exposure. The loss due to exposure was in some cases nearly one-half the price of unexposed cotton, or at 1932 and 1933 prices about $13 per 500-lb. bale.

All of the cotton lost strength, but not equally, upon exposure. There was an average loss of 4 percent after 4 weeks and a maximum loss of approximately 14 percent for the season. Cotton grown at Temple lost the lowest and that grown at Lubbock the highest percentage of the original strength. These differences were not attributed entirely to differences in rainfall but might have been due partly to greater ultraviolet in the sunlight at the higher altitude. Regional and seasonal differences were noted in the color. All cottons became darker and less creamy as the exposure increased. In all cases there was a decrease in either creaminess or brightness, or in both, within from 3 to 5 weeks after opening. Cotton which had opened after frost was stained and much yellower than that opened before frost. Precipitation apparently caused greater darkening than it did loss in creaminess. The grades appeared to follow brightness more closely than creaminess.

Three lots of lint cotton stored in a vault for 1 yr. had lost respectively 7, 15, and 18 percent of their original strength, and after 2 yr. of storage two lots had lost 25 and 33 percent.

Conclusions were that cotton should be harvested, so far as is practicable, not later than 4 or 5 weeks and preferably within 1 or 2 weeks after opening to assure a product of high quality in grade, strength, and color.

Influence of storage temperature and humidity on seed value of potatoes, O. SMITH (*[New York] Cornell Sta. Bul. 663 (1937), pp. 31, figs. 14*).—Field studies made, 1932–35, to determine effects of various methods of storing seed potatoes on subsequent plant growth and yield involved the Irish Cobbler and Smooth Rural varieties. Comparisons were made between storage in five commercial potato-storage houses and at various locations within each storage. Seed also was stored in constant-temperature cold-storage rooms during the entire storage period at both high and low humidities. Temperature shifts also were made for other treatments from 5 to 8 weeks before planting.

Low humidity in storage was found to result in the least sprouts per seed piece but in the longest individual sprouts. The most sprouts appeared on tubers stored at 40° F. and later shifted to 50°, but they were rather short. The final stand of plants usually was lower from seed stored at 32° than from that stored at higher temperatures. Differences in the rate of emergence of plants were not so marked as expected from differences in average storage-season temperatures and humidities between the several commercial storages. This seemed due primarily to the fact that unless the tubers are removed from storage and planted early, the temperature in all storages for the last month or two exceeds sprouting temperature. Plants from tubers stored in constant-temperature cold-storage rooms appeared above ground in the order 50°, 40°, 35°, and 32°. The most stems per seed piece, the largest total number of tubers per plant, and the most U. S. No. 1 size

tubers were produced by tubers stored at the higher temperatures. Storage treatments which produced plants above ground first did not always result in highest yields of tubers. Plants from tubers stored at any treatment with an initial temperature of 50° matured about 7 to 10 days earlier than those stored at 40°.

The two varieties responded differently in yields of tubers to the same storage conditions. The highest yields of Irish Cobbler usually were obtained from storage at 40° for all or part of the storage period, whereas highest yields of Smooth Rural resulted from storage at 50° for part or all of the storage period. Sprout growth with Irish Cobbler, it seemed, becomes too extensive for maximum yields when stored at 50°, whereas with Smooth Rural sprout growth is slower and reaches optimum at 50° or slightly lower.

"In localities where early planting usually results in highest yields it would be desirable to store seed at the higher temperatures so that sprout growth at planting time would be as large as possible without having them damaged or broken off in the cutting and planting operations. Where later plantings usually result in highest yields, any treatment which suppresses sprout growth, such as low temperatures, will result in increased yields unless planting is delayed too long."

Effect of soil reaction on growth, yield, and market quality of potatoes, O. Smith ([New York] Cornell Sta. Bul. 664 (1937), pp. 21, figs. 16).—Smooth Rural potatoes were grown, 1932–36, on 30 plats of varying degrees of soil reaction. The orginal reaction, from pH 5.4 to 5.7, was adjusted by the use of sulfuric acid and hydrated lime so that a range in soil reaction of about from pH 4.75 to 8 was maintained after the first year.

Vine growth was less vigorous and the foliage lighter green on soil that was too acid or too alkaline as compared with plants on soil with favorable reaction. Early death of the plants was another indication of too-acid or too-alkaline soil. Rate of emergence was slower in the most alkaline plats, whereas in the most acid plats it was slow in the first and second years but fastest during the third year after the sulfuric acid was applied. The final stand of plants and the number of stems per plant were not influenced by soil reaction within the experimental range.

The soil reactions more acid than pH 4.8 resulted in reduction of number of tubers per plant. At the higher pH values a marked reduction occurred in the number of No. 1 and in total number of tubers per plant. Plants on the most alkaline soils produced a lower percentage of and smaller No. 1 tubers than those on less alkaline or on acid soils. Yields were reduced on soils more acid than about pH 4.8. In general, no significant differences in total yield existed between plats with reactions of approximately from pH 4.8 to 7.1, but significant yield decreases occurred in plats with soil reaction exceeding about from pH 7 to 7.5.

With the scabby tubers removed, the highest percentage of U. S. No. 1 grade potatoes came from the most acid and most alkaline soils and the lowest percentage from soils between pH 6 and 7, sometimes as high as pH 7.8. A gradual increase occurred in the percentage of scabby tubers from the most acid plats up to those with the reactions pH 6.51 to 6.58 in 1932, pH 7.8 to 7.95 in 1933, pH 6.94 to 7.53 in 1934, pH 7.34 to 7.37 in 1935, and pH 6.71 to 6.76 in 1936. In soils with reactions above these the percentage of scabby tubers always was reduced markedly.

The Houma potato: A new variety, C. F. Clark, F. J. Stevenson, and J. C. Miller (U. S. Dept. Agr. Circ. 420 (1936), pp. 4, fig. 1).—The Houma potato, derived from Charles Downing × Katahdin (E. S. R., 74, p. 630), is described from studies in cooperation with the Louisiana and other experiment

stations as a vigorous-growing, late-maturing variety that produces smooth, nearly round tubers, slightly flattened at the apex, with shallow eyes, dark buff in color, and high in cooking quality. In a number of tests it compared favorably in total yield with Katahdin, Chippewa, Irish Cobbler, and Green Mountain. It appeared to be well adapted to Maine, North Carolina, and particularly to Louisiana where its many desirable characteristics led it to be considered of much promise.

HORTICULTURE

[Horticultural investigations by the Florida Station] (*Florida Sta. Rpt. 1936, pp. 41, 42, 58, 59, 61, 73–79, 80–82, 110–113, 118–122, 140, 148–151, 152, 153, figs. 5*).—Among studies, the progress of which is discussed, are the breeding and testing of new sweet corns, by F. H. Hull and W. A. Carver; potash requirements and effects on citrus and concentrated and other fertilizers for citrus, both by R. W. Ruprecht; soil and fertilizer needs of celery, by E. R. Purvis and Ruprecht; variety response of pecans to different soil types, cover crops for pecans, effect of zinc sulfate on pecan rosette, fertilizer requirements of the pecan, and the extraction of oil from kernels of different varieties, all by G. H. Blackmon; propagation, breeding, and fertilizing tests with tung oil trees, by A. F. Camp and R. D. Dickey; variety-testing and propagation of ornamentals, by Camp and Blackmon; variety trials with truck crops, soil pH needs of truck crops, and cover crops for vegetable culture, all by F. S. Jamison; comparison of mulch, clean culture, and no cultivation for citrus, by Camp; relation of nitrogen absorption to food storage and growth in the pecan, by Blackmon and Camp; variety tests of blackberries, by Camp and H. S. Wolfe; preservation of citrus juices and pulps, strawberries, and Youngberries, by Camp and A. L. Stahl; maturity studies with citrus, by Stahl; and effects of zinc and other unusual minerals on citrus, by Camp.

Studies at the Citrus Substation include citrus progeny and bud selection, propagation experiments with citrus, testing of new varieties and hybrids of citrus and near citrus, and rootstock trials with citrus, all by J. H. Jefferies.

Studies reported by the Everglades Substation include rootstocks for grapefruit, trials of *Casuarina lepidophloya* for pulp and firewood, forcing of Easter lily by low temperature treatment, and pollination and seed setting in the Easter lily, all by G. R. Townsend and R. N. Lobdell; fertilizer requirements of celery, cabbage, and other vegetables, by A. Daane, R. E. Robertson, and F. D. Stevens; and miscellaneous variety tests of vegetables, by Townsend.

Studies at the Subtropical Substation include tests of various windbreak and forest species, trials of minor fruits and ornamentals, culture of the avocado, and culture of citrus, all by H. S. Wolfe; culture and breeding of the tomato, and variety tests of miscellaneous vegetables, all by W. M. Fifield.

[Horticultural investigations at the Georgia Coastal Plain Station] (*Georgia Sta. Bul. 26 (1936), pp. 66–74, 76–90, 102–106, fig. 1*).—Included are reports on variety, cultural, and fertilizer studies with tomatoes, watermelons, lima beans, and other vegetables, development of wilt-resistant watermelons and root-rot-resistant beans, variety tests of various tree fruits, grapes, and pecans, improvement of the blueberry by plant selection, and varietal and adaptation tests with citrus fruits and tung oil.

[Horticultural investigations conducted by the Maine Station] (*Maine Sta. Bul. 384 (1936), pp. 389–391, 401, 429, 430, fig. 1*).—Studies, the progress of which is discussed, include nature of winter injury to the apple and the comparative resistance of different apple rootstocks to low temperature, both by M. T. Hilborn; boron requirements of rutabagas, by F. B. Chandler, J. A.

Chucka, and I. C. Mason; and burning of blueberry fields and the control of weeds therein, by Chandler and Mason.

[Horticultural investigations at the Oklahoma Station], F. B. Cross, G. F. Gray, E. F. Burk, I. C. Haut, J. E. Webster, and [G. W.] Cochran (*Oklahoma Sta. [Bien.] Rpt. 1935–36, pp. 43–55, 56–59, 60–62, 63, 71–73*).—Among studies discussed are those dealing with soil management of pecan groves, varieties and propagation of pecans, development of vineyards, grape varieties, uneven color development in the Concord grape, small fruit varieties, soil management in apple and peach orchards, varieties of apples, peaches, and plums, variety tests of vegetables, culture of asparagus and broccoli, varieties of cantaloups, development of a spineless okra, greenhouse tomato culture, effect of fertilizers on the shipping qualities of strawberries and tomatoes, use of synthetic manures in heating hotbeds, and the influence of variety on the composition of grape juices.

[Horticultural investigations by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 336 (1936), pp. 5, 27, 32–34, 35*).—Brief results are presented on studies of synthetic composts for mushrooms, by J. W. Sinden; improvement of winter cabbage and of the Penn State tomato, by C. E. Myers and M. T. Lewis; fertilizers for truck crops on Hagerstown soils, by W. B. Mack; head lettuce breeding, by Lewis; breeding of inbred strains of sweet corn, by Myers and Lewis; asexually propagated rootstocks of cherry, by R. D. Anthony; new varieties of apples, by R. H. Sudds; new ornamental shrubs, by R. P. Meahl; cabbage variety and strain trials and pea variety trials, both by Mack and F. W. Haller; sweet corn and tomato variety and strain trials, by Mack, G. J. Stout, and Haller; and variety trials of celery, lettuce, onions, and spinach, by Mack.

[Horticultural investigations by the South Carolina Station] (*South Carolina Sta. Rpt. 1936, pp. 23–28, 100–106, 130–136, figs. 3*).—Included are reports on the following projects: Factors associated with the fruiting of the Fordhook bush lima bean, and variety trials of vegetables, both by F. S. Andrews; organic food reserves in the asparagus crown, fertilizer requirements of asparagus, time of cutting asparagus, and the testing of peach and grape varieties, all by L. E. Scott; fertilizer requirements of beans and cabbage, variety tests of lima beans, tomatoes, peas, and other vegetables; production of snap bean seed, effects of basic slag and dolomitic limestone on snap beans, and cabbage breeding, all by J. M. Jenkins, Jr.

[Horticultural investigations at the South Dakota Station], N. E. Hansen (*South Dakota Sta. Rpt. 1936, pp. 29–32, 33*).—Brief reports are presented on apricot breeding, apple breeding, testing of Siberian crabs as rootstocks, testing of new Siberian bird cherries, breeding of roses, development of thornless rose stocks, tomato breeding, improvement of the sand cherry, and iris breeding.

Orchard and garden crops (*Utah Sta. Bul. 276 (1936), pp. 55–62, figs. 6*).—Included are general progress statements on rootstock studies with cherries and apricots, embryo abortion in the sweet cherry, nomenclature of apricot varieties, desirable varieties of sweet and sour cherries, peaches, and plums for Utah, all by F. M. Coe; and storage of onions, the improvement of the sweet Spanish onion by selection, spacing of onions, and use of electricity for heating hotbeds, all by A. L. Wilson.

[Horticultural studies at the Wyoming State experiment farms] (*Wyoming Sta. Bul. 219 (1937), pp. 17–19, 21, 22, 25, 39, 43, fig. 1*).—Included are brief reports of studies of species for shelterbelt uses, the value of irrigation for vegetables, improvement of the apple by development and selection of seed-

lings, varietal tests of vegetables and fruits, time of planting vegetables, and improvement of the garden bean by selection of desirable plants.

Available nutrients in lawn, garden, and greenhouse soils, F. F. Weinard (*Amer. Soc. Hort. Sci. Proc., 32 (1935), p. 654*).—A tabulated summary is presented of the results of tests for soil reaction, available nitrogen, phosphorus, and replaceable potassium in soil samples collected by the Illinois Experiment Station from 57 lawns, 35 gardens, and 51 floricultural greenhouses. The pH ranges found in the lawns, gardens, and greenhouses were, respectively, 5.6 to 8.2, 4.7 to 8.2, and 4 to 8.3.

Supplementary illumination from Mazda, mercury and neon lamps on some greenhouse plants, G. H. Poesch (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 637, 638*).—Normal light and normal light plus 4 hr. of supplementary light from (1) two 225-w clear glass Mazda lamps, (2) 450 w of neon lamps, and (3) 450 w from mercury vapor lamps, were compared at the Ohio State University for pansies, chrysanthemums, and other ornamentals. In every case the plants under Mazda lamps had longer stems but the quality of the flowers was not reduced. The color of the foliage was paler under supplementary light. The records showed that the Mazda lamps were superior to both neon and mercury in promoting earliness of bloom, total production, and stem length.

A further trial of ring grafting to produce stock effects, R. H. Roberts (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 358, 359*).—Additional data presented by the Wisconsin Experiment Station (E. S. R., 73, p. 614) showed that certain combinations of stem and bark gave somewhat different results in 1935 than in 1934, apparently because of seasonal influences. When rings of bark were inverted from the normal position the tops were dwarfed, with dark green leaves, slender shoots, and a delayed accumulation of starch.

Analyses of materials sold as insecticides and fungicides during 1936, C. S. Cathcart and R. L. Willis (*New Jersey Stas. Bul. 617 (1936), pp. 16*).—This bulletin presents in the usual manner (E. S. R., 74, p. 338) the results obtained from the inspection of 1936.

Some factors associated with dormancy of lettuce seed, R. C. Thompson (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 610–616*).—Seeking an explanation of the occurrence and development of dormancy in lettuce seed, the author, working at the Horticultural Research Station, Beltsville, Md., made germination tests of seed from individual plants of 25 varieties. He observed not only wide variation between varieties but between individual plants in a single variety. Of all the varieties tested, Hubbard Market exhibited dormancy most consistently and Iceberg was by far the freest. Grand Rapids and Iceberg seeds harvested in a fully mature condition developed more readily than seeds harvested when well developed but with peduncles still green. Where Grand Rapids seed was harvested in three stages, (1) fully mature, (2) with yellow involucres, and (3) with green involucres, good results were obtained in both light and darkness in the first instance, good results were secured with light treatment in the second case, and little germination with any treatment in the third instance. Lot 2 exhibited the characteristics of dormant seed, all of which leads the author to suggest that inadequate nutrition may be concerned in dormancy in lettuce. The fact that light seed producing varieties such as Iceberg are freer from dormancy than the heavy seed producers suggests also a relationship with nutrition. Under heavy seed producing conditions, lack of adequate nutrients may prevent the development of the embryos to a stage permitting germination immediately following harvest.

Effect of fertilizer on quality and chemical composition of canning peas, F. L. Musbach and O. E. Sell (*Jour. Agr. Res. [U. S.], 53 (1936), No. 11, pp. 869–879*).—Studies conducted by the Wisconsin Experiment Station with Per-

fection peas grown on Colby silt loam and Advancer peas on Miami silt loam indicated, in general, that well-balanced complete fertilizers increased yields and improved the quality of the canned product. Analyses of the seed coats of peas from the Colby soil revealed a general trend, irrespective of fertilizer treatment, toward a consistent decrease in the percentage of nitrogen content with advancing maturity, assuming that the larger peas are the more mature. Phosphorus content of the skins showed the same general trend as nitrogen, but no definite relationship was noted between potassium content and maturity or with the potassium content of the fertilizer used. A relationship was established between the calcium content of pea skins and the potassium content of the fertilizers. In general, potassium in the fertilizer tended to diminish the concentration of calcium in the seed coat. In fact, all the fertilizer treatments reduced the calcium concentration in the seed coat. No definite relation was established between calcium in the seed coat and the quality of the canned product.

The chemical composition of whole peas included studies of sugar and starch. Variations in quality of the canned product could not be explained by differences in the sugar and starch content of fresh peas, leading to the conclusion that variations in quality of peas harvested at relatively early stages of maturity are due to variations in organic compounds other than sugar and starch.

Chemical studies on the open-pollinated, top-cross, and hybrid inbred strains of yellow sweet corn in relation to the quality of the canned product, R. R. JENKINS and C. B. SAYRE (*Food Res., 1 (1936), No. 2, pp. 199–216, figs. 3*).—Records taken by the New York State Experiment Station showed that hybrid strains of sweet corn are superior to open-pollinated varieties from the standpoint of increased quality, slower rate of increase in maturing of ears, and a much longer harvest spread due to a slower increase in total solids and of alcohol-insoluble solids. It was observed that the percentages of total solids and of alcohol-insoluble solids may serve equally well as indices of maturity and of quality in canned whole-grain sweet corn of the types studied. The percentages of total solids and of alcohol-insoluble solids were lower in the canned than in fresh corn.

Some results of horticultural experimentation at Mountain Grove, P. H. SHEPARD (*Missouri State Hort. Soc. Proc., 1933–34, pp. 69–75*).—Among studies discussed in this brief report are variety tests of new fruits, the development of winter-resistant apple trees by double working on a hardy interstock, the value of potassium permanganate for stimulating callus and root development in grape cuttings, the growing of vinifera grapes, height of heading young apple trees, and a comparison of mulch and tillage for apple trees. Trees under the straw mulch system responded very favorably in growth, survival, and productivity.

Tree fruit varieties in north Texas, L. E. BROOKS (*Texas Sta. Bul. 535 (1936), pp. 26, figs. 3*).—Varietal investigations begun at the Wichita Valley substation in 1926 have shown that apples and pears are unsatisfactory in this area because of their susceptibility to cotton root rot. Cherries proved unadaptable, dying generally from natural causes without reaching fruiting age. Peaches and plums proved to be the most dependable tree fruits for the area, and the Moorpark apricot gave promise of being a valuable variety. In the case of peaches and plums varietal selection was an important feature, with resistance to late spring freezes a most important characteristic. A few peaches and plums fruited in six or seven years. The Dr. Burton peach proved outstanding in yield and consistency of fruiting.

A simple method of obtaining fruit trees on their own roots, W. L. KERR (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 355–357, fig. 1*).—At the Dominion Experimental Station at Morden, Manitoba, apple scions grafted into the basal

rather than the customary apical end of the stock produced roots above the union rather freely, thus permitting the ready development of own-rooted trees. There was apparently an accumulation of nutrients above the point of the union, resulting in scion root development. The stock, on the other hand, was stunted, produced no rootlets, and was easily separated from the scion.

Some observations on the production of own-rooted apple stocks from root cuttings, V. T. STOUTEMYER, T. J. MANEY, and B. S. PICKETT (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 350–354, figs. 3*).—Using a heated closed propagating frame in the greenhouse of the Iowa Experiment Station, 6-in. root pieces of Virginia crab, laid horizontally on the surface of moist sand, formed an abundance of shoots. Similar results were secured with root cuttings of *Malus sargentii* and *M. baccata*. The best results were secured when roots were taken from dormant trees. Two lots of softwood cuttings taken from the sprouts of Virginia crab when placed in an open propagating bench rooted abundantly. The original root pieces produced a moderate second crop of shoots. The plants grown from the softwood cuttings developed much more satisfactorily than did those from shoots with a piece of the original root still attached. Apparently the presence of the root piece and its fibrous roots prevented the ready development of new roots on the young shoot.

The influence of water deficiency in photosynthesis and transpiration of apple leaves, A. J. HEINICKE and N. F. CHILDERS (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 155–159*).—Observations at Cornell University on leaves of McIntosh, Baldwin, and Delicious apple trees, growing in the greenhouse in containers supplied with different amounts of water, showed that gradual drying of the soil is accompanied by an appreciable reduction in the rates of transpiration and photosynthesis. Both the dry and control plants frequently showed a greater assimilation in the morning than in the afternoon and, in general, transpiration showed the same tendencies as the carbon dioxide assimilation. However, drying of the soil affected transpiration somewhat sooner than it did photosynthesis, apparently because of the closing of the stomata, which tended to conserve water to a greater extent than it reduced photosynthesis.

The "graduated space" method of thinning apples, H. P. GASTON and G. L. RICKS (*Michigan Sta. Spec. Bul. 281 (1937), pp. 30, figs. 7*).—Following an earlier paper (E. S. R., 74, p. 642) in which it was shown that the natural tendency of weak slender branches is to produce small apples and that in pruning it is desirable to remove such growths instead of the thicker and more vigorous wood, the authors discuss fruit-thinning experiments in eight representative Michigan orchards including several varieties of apples. Graduated-space thinning in which fruits were spaced according to the diameter of the branch was compared with uniform-distance thinning and with no thinning. Both types of thinning reduced total yields, graduated-space thinning about 10 percent and uniform thinning about 17 percent. Graduated- and uniform-space thinning reduced the percentage of apples less than 2.25 in. in diameter by 84 and 56 percent, respectively. At the same time, fruits 2.5 in. or more in diameter were increased by 99 and 56 percent, respectively, over the nonthinned trees. Color grade was also improved by thinning. Of major significance was the fact that graduated-space thinning yielded sufficient increments in sale value to yield a substantial profit for the thinning operations. The practice of graduated-space thinning is explained in detail.

Repairing injured apple trees, C. W. ELLENWOOD and T. E. FOWLER (*Ohio Sta. Bimo. Bul. 184 (1937), pp. 27–32, figs. 3*).—Stating that the low temperatures of the 1935–36 winter caused severe injury to the trunks and crotches of apple trees, the authors present information on the treatment of injured trees and on the nature of the injuries. Among points considered are wound dress-

ings, bridge grafting, cleansing and filling of cavities, and the bracing of weakened limbs.

Prevention of storage wastage in Cox's Orange Pippin apples: Results of cold-storage investigations, R. SUTHERLAND (*New Zeal. Jour. Agr., 53 (1936), No. 1, pp. 12–19, figs. 6*).—Cox Orange Pippin apples grown on sandy loams were found less susceptible to bitter pit and internal break-down than comparable apples from clay soils. Maturity was a factor in the incidence of bitter pit, the disease becoming progressively less as harvesting was delayed, but susceptibility to internal break-down and fungal rotting increased. Internal break-down was less in fruit stored at 37° F. than at 34°. Mature, ripe apples were more easily bruised in packing than less mature fruits.

Production of cherry seedlings from freshly harvested seed [trans. title], R. VON VEH (*Züchter, 8 (1936), No. 12, pp. 305–312, figs. 16*).—In this succeeding paper (E. S. R., 75, p. 781), the author discusses the production of seedlings from embryos extracted from freshly harvested cherry seeds of several different varieties. The flotation method proved satisfactory in separating potentially viable and nonviable seeds, those with well developed embryos sinking usually to the bottom. Water was apparently a very important factor in determining the early development of cherry seeds. While surrounded by the nucellus the water-assimilation capacity of the embryo was distinctly hindered.

A relation between seed attachment and carpel symmetry and development in Prunus, H. B. TUKEY (*Science, 84 (1936), No. 2188, pp. 513–515, fig. 1*).—In examinations at the New York State Experiment Station of 24 varieties of peach, plum, cherry, apricot, and nectarine, it was observed that in cases of asymmetric fruits the seed is attached to the larger and better developed side of the carpel. Apparently in the case of a simple fruit the position of the embryo in relation to the carpel and its point of attachment to that carpel affects markedly the shape and development of a portion of the fruit.

Results of mulching black raspberries, L. HAVIS (*Ohio Sta. Bimo. Bul. 184 (1937), pp. 18–20*).—Cumberland raspberries planted in 1928 and mulched in March 1935 with wheat straw at the rate of 5 to 6 tons per acre were superior in vigor and general appearance to adjacent comparable cultivated plants. Soil nitrates were usually lower in the mulched plats during the spring and summer, but average moisture content was higher and more uniform. In 1936, the number of new canes produced was definitely higher in the mulched areas. Yields were somewhat larger on the mulched plats, but the experiment was terminated before final conclusions could be drawn.

Leaf-bud propagation of several introduced species of Rubus, C. C. THOMAS (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 377–379*).—The following forms of *Rubus* were rooted successfully in a comparatively short period from leaf-bud cuttings placed in clean sharp sand in a heated propagation frame: *R. armeniaca*, *R. ellipticus*, *R. fraxinifolia*, *R. glaucus*, *R. parvifolia*, and *R. leucodermis*, the Brainerd blackberry, and the Van Fleet raspberry. All of these forms root from the tips of canes, indicating a correlation between cane tipping habit and capacity to propagate by leaf cuttings.

Harvesting and handling citrus fruits in the Gulf States, J. R. WINSTON (*U. S. Dept. Agr., Farmers' Bul. 1763 (1937), pp. II+38, figs. 20*).—Superseding Farmers' Bulletin 696 (E. S. R., 34, p. 235), this presents general information on harvesting operations, management of the packing house, control of diseases in harvested fruits, grading, packing, precooling, transportation, etc.

Bud selection in Eureka and Lisbon lemons and progeny tests of bud variations, A. D. SHAMEL, C. S. POMEROY, and R. E. CARYL (*U. S. Dept. Agr.,*

Tech. Bul. 531 (1936), pp. 44, figs. 25).—In this further contribution to the general subject (E. S. R., 43, p. 440), the authors describe and depict some of the more important variations occurring in the two varieties and present in tabular form the performance records taken over a long period of years on the progeny of different strains. Three types of variation were distinguished, (1) those occurring as limbs on otherwise normal trees, (2) as entire trees differing in one or more well-defined characters, and (3) individual fruit variations. The progenies of the limb and entire tree variations performed like their parents with respect to yield, growth, time of year in which they bore most of their fruit, shape and size of fruit, texture and thickness of the rind, juiciness, and acidity of the juice. The results indicate that bud selection based on performance records permits, through the choice of buds from superior trees or limbs, the isolation of commercially superior varieties of Eureka and Lisbon lemons.

Regeneration of date palm roots, R. H. Peebles (*Amer. Soc. Hort. Sci. Proc., 32 (1935), p. 376, fig. 1*).—Observations in Arizona showed that date roots had regenerated new root tips when examined 97 days after excision. New growth was vigorous and approximated in diameter that of the older portion.

Miscellaneous plants under cloth enclosure, D. Foote and A. Laurie (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 642–644*).—Observations are presented on the results of studies at the Ohio State University on the growing of roses, hydrangeas, chrysanthemums, gardenias, kalanchoe, and stocks in cloth-covered enclosures such as used for China asters. In all cases favorable responses were secured from the cloth cover.

Growth responses of some ornamental plants to temperature, K. Post (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 647, 648*).—Providing two temperature environments, namely, 50° to 60° F. and 60° +, it was found at the [New York] Cornell Experiment Station that the following ornamentals may be grouped roughly according to their response to temperature as follows: (1) Those which grew very little below 60°, *Hunnemannia* and *Browallia*, (2) those which grew but did not flower below 60°, *Trachymene* and *Clarkia*, and (3) those which grew above 60° but required lower temperature to form flower buds, *Mathiola* and *Cytisus*.

Flowering response to temperature in China aster, J. P. Biebel, L. Greene, and R. B. Withrow (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 645, 646*).—Studies at the Indiana Experiment Station of the effect of variations in temperature on the photoperiodic response of the Heart of France variety of China aster indicate that higher temperature may affect greatly not only the time of blooming in the aster and the character of the inflorescence produced but may induce flowering despite unfavorable length of day. The authors point out that the aster responds differently from the stock, wallflower, beet, cabbage, and celery, where high temperatures tend to inhibit flowering. Under the short days of late autumn and early winter, the stems were shorter and the flowers were somewhat smaller but had good form and color.

Reduction of daylight period on asters, A. Laurie and D. Foote (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 639–641*).—Further information (E. S. R., 75, p. 349) is presented on the results of photoperiodic studies with garden asters. Reduction of daylight induced earliness in all seven varieties, but in Royal Shell Pink the flowers produced were on such short stems as to be of little economic value. In most cases reduced light resulted in slightly smaller flowers. Supplemental light used on seedlings for two weeks prior to transplanting out of doors had no marked effect on subsequent behavior.

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Some studies on the forcing of Delphinium, H. E. White (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 653, 654*).—At the Massachusetts Experiment Station field-grown plants held for eight weeks, beginning August 17, in cold storage at 34° to 36° F., and planted October 24 in a greenhouse came into bloom on December 24, whereas comparable untreated plants made no growth at all. Potted plants placed in cold storage on July 15 and planted September 14 commenced blooming November 1. On the whole, however, field-grown plants gave better results than potted plants.

Some effects of temperature and light upon the flower bud formation and leaf character of stocks (Mathiola incana), K. Post (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 649–652*).—In this further contribution (E. S. R., 75, p. 351) the author presents evidence of the profound influence of temperature on the flowering and growing habits of the garden stock. For example, plants grown at temperatures above 60° F. at night and at lower temperatures during the day produced pinnately lobed leaves and flowered, while plants held below 60° during the night and above 60° during the day produced entire to sinuate leaves and no flowers.

Abscission of sweet pea flower buds, J. E. Smith (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 663–668, figs. 2*).—At the Indiana Experiment Station normal and dropping sweet pea buds collected at various stages of development were examined microscopically. After discussing the general anatomy of the sweet pea bud and the formation of the abscission layer, the author points out that the most marked difference between the developing and dropping bud is a drying out of the flower parts of the latter. Apparently bud drop results from the desiccation and degeneration of flower parts caused by an upset in the carbohydrate-nitrogen balance during periods of cloudy weather.

Our friends the trees, P. G. Cross (*New York: E. P. Dutton & Co., 1936, pp. 334, [pls. 31, figs. 52]*).—General information is presented on economic importance, botanical relationships, planting, culture, utilization, etc.

FORESTRY

Forestry and permanent prosperity, R. F. Hammatt (*U. S. Dept. Agr., Misc. Pub. 247 (1936), pp. 20, figs. 29*).—Among subject matter covered in this general discussion is material relating to forestry as an aid to economic recovery, the national forests, farm woodlands, national forest ranges, the acquisition of forest lands by public agencies, sustained-yield management and permanent communities, wildlife, recreational use of the forest, forest research, etc.

Ohio Forest News [February 1937] (*Ohio Forest News [Ohio Sta.], No. 30 (1937), pp. 8, figs. 2*).—This contains brief notes of a popular nature on the status of the forests, conservation activities, etc.

[Forestry investigations by the Pennsylvania Station], J. A. Ferguson (*Pennsylvania Sta. Bul. 336 (1936), pp. 6, 31, 32*).—Brief results are presented on planting distances for red pine, competition in experimental forest plantings, and spacing forest trees in plantings.

Physical and chemical studies of two contrasting clay forest soils, R. L. Donahue (*Jour. Forestry, 35 (1937), No. 1, pp. 16–23, figs. 5*).—In studies by the Mississippi Experiment Station of the total amounts of several important mineral elements in two contrasting forest soils, namely, fertile Sharkey clay from the Delta region and relatively infertile Lufkin clay from the Flatwoods region, the former was found higher in all the potential elements of fertility to the depths that soil samples are taken usually. However, at a depth of from 6 to 8 ft. the Sharkey clay contained less moisture, less organic and vola-

tile matter, less magnesium and silt-plus-clay, and no greater amounts of potassium, phosphorus, and nitrogen. Mechanical analyses showed little difference between the two soils, with indications that both contained too much silt-plus-clay and too little sand for the best growth of trees.

Some soil characters influencing the distribution of forest types and rate of growth of trees in Arkansas, L. M. TURNER (*Jour. Forestry, 35 (1937), No. 1, pp. 5–11*).—Based on studies conducted by the Arkansas Experiment Station, the author concludes that soil features influencing the supply of available water appear to be more influential than other factors in determining the rate of growth of pine trees. Among factors influencing water movement are degree of slope and the depth and physical structure of the different horizons.

The effect of frequent fires on profile development of longleaf pine forest soils, F. HEYWARD (*Jour. Forestry, 35 (1937), No. 1, pp. 23–27, figs. 2*).—The greater percentage of longleaf pine forest soils is said to be morphologically more similar to grassland than forest, the A_1 horizon being dense and relatively impenetrable. Where fire was excluded there developed a forest floor 2 to 3.5 in. thick, which permitted the establishment of an active soil fauna and a penetrable and porous A_1 horizon. Periods of fire exclusion as short as 10 yr. brought about great changes in soil characteristics.

Growth of Douglas fir trees of known seed source, T. T. MUNGER and W. G. MORRIS (*U. S. Dept. Agr., Tech. Bul. 537 (1936), pp. 40, figs. 7*).—Seedlings grown from seed collected in the fall of 1912 in 13 different localities in western Washington and western Oregon, all within the commercial range of the species, were planted in replicated plats on burned-over uncultivated soil in four localities and at five different elevations ranging from 1,100 to 4,600 ft. The trees were observed and measured in 10 different years from 1915 to 1931.

An analysis of the data indicated that the age of the parent trees, the quality of their growing site, their growing space, and their condition as to fungus infection had exerted no influence on the height growth of the progeny. On the other hand, the altitude at which the parent trees grew did in some instances affect greatly the performance of the progeny. One stock from a high altitude made much less than the average growth when planted in the equable climate of the Oregon coastal hills and grew much better than average at high elevation in the Cascades. In contrast, a stock from the Oregon coastal hills made less than average growth when planted at high altitudes but thrived at low elevations. Several stocks grew equally well in all localities, indicating a greater adaptability to environment. Two of the stocks made unusual height development at each trial station, and since no character of the parents could be associated with this height supremacy, the quality is attributed to inherent variations. Mortality in the plantations could not be associated with seed source. Marked differences were noted in the dates at which the various progenies burst their leaf buds, and since occasional severe frost injury followed early bursting of the buds, it is considered advisable to match seed source with planting site on a basis of climate unless the stock is of proven adaptability. The quality of the sites upon which the test plantations were established had a profound effect on growth irrespective of the source of the stock. A temporary stimulus to seedling growth was imparted by large seed.

Notes on the terminal growth of coniferous plantations in the Hudson Highlands, H. H. TRYON and R. F. FINN (*Black Rock Forest Papers, 1 (1937), No. 9, pp. 53–56, figs. 3*).—Measurements taken in plantings of *Picea glauca*, *P. abies*, *Pinus resinosa*, *Larix decidua*, and *L. gmelini* indicated that the first three species make their maximum weekly terminal growth during the last week of May. The deciduous larches reached their maximum considerably

later. As a result the authors suggest that release cuttings of competing hardwoods should be made in early spring before these maxima are attained in order to secure the greatest benefits from thinning.

Diameter outside bark as an index of bark thickness at breast height for red and chestnut oak, H. F. Scholz (*Black Rock Forest Papers, 1 (1937), No. 8, pp. 49–52, fig. 1*).—Based on measurements in 459 chestnut oak and 418 red oak trees, the author suggests that diameter inside the bark and bark thickness of the two species is in the Hudson Highlands region a function primarily of the diameter outside the bark and secondarily of various other factors such as site, stand density, and age.

Cordwood volume tables for red oak and red maple in the Hudson Highlands, H. H. Tryon and R. F. Finn (*Black Rock Forest Papers, 1 (1937), No. 7, pp. 45–47*).—The included tables, according to the authors, are accurate to the extent of a variation not greater than 4 percent from actual yields.

Harvesting and marketing timber in New York, R. J. Hoyle (*N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 49 (1936), pp. 186, figs. 59*).—This is a discussion of the harvesting of trees and forests and the preparation of the crude products for use or further manufacture.

Structure, occurrence, and properties of compression wood, M. Y. Pillow and R. F. Luxford (*U. S. Dept. Agr., Tech. Bul. 546 (1937), pp. 32, pls. 9, figs. 8*).—Compression wood, one of the abnormal types formed by coniferous species under certain environmental conditions, as a rule on the lower sides of nonvertical trunks and branches, is characterized by high and irregular longitudinal shrinkage, low strength for its weight, and excessive hardness. An increase in the amount of deviation of trunks from the vertical, or an increase in the rate of diameter increment of individual trees, or both, tend to increase the formation of compression wood.

Microscopical examinations showed the summerwood tracheids of compression wood to be nearly circular in cross section as compared with a rectangular aspect in normal wood. The fibrils of the secondary cell walls in the compression wood made a higher angle in relation to the longest axis of the cells. The lignin content was slightly higher and the cellulose content slightly lower in compression wood. Pronounced compression wood was from 15 to 40 percent heavier than normal wood and longitudinal shrinkage in drying was much greater. Transverse shrinkage was less than normal. The lower strength properties in compression wood are associated closely with the differences in the slope of the fibrils. When manufactured into lumber, compression wood is accountable for much bowing and twisting.

Among silvicultural measures suggested to reduce compression wood are the early removal of defective and crooked trees, proper spacing to insure uniform growth, and the avoidance of large and irregular openings in the crown canopy to permit the entrance of violent winds.

Forest fire insurance in the Pacific Coast States, H. B. Shepard (*U. S. Dept. Agr., Tech. Bul. 551 (1937), pp. 168, figs. 17*).—The several sections discuss the need for forest fire insurance, the principles of fire insurance applicable to forest properties, practical considerations in the application of forest fire insurance, the contributive, causative, and conflagration hazards, forms of insurance recommended, and rate schedule construction.

"The outcome of the inquiry is, in brief, a recommendation in favor of forest fire insurance in the Northwest as a feasible and profitable undertaking where proper precautions are observed. The normal loss expectation from ordinary fire occurrence averages 0.082 percent per year, but it is recommended

that commercial forest fire insurance introduced in these regions be based on an average premium rate of 0.450 percent."

DISEASES OF PLANTS

The Plant Disease Reporter, February 15 and March 1, 1937 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 21 (1937), Nos. 3, pp. 41–68, pl. 1, figs. 2; 4, pp. 69–83, fig. 1*).—The following items of interest are included:

No. 3.—Early appearance of tobacco downy mildew (*Peronospora tabacina*) in Georgia in 1937, by J. G. Gaines; dates of first appearance of tobacco downy mildew (a list of the earliest dates reported to the Plant Disease Survey in the various States for 1921 and 1931–36); report of the work of the Tobacco Disease Survey Committee for 1936, compiled by L. Shaw; occurrence of curly top on vegetables and other susceptible hosts in the Pacific Northwest in 1936, by B. F. Dana; *Ascochyta lycopersici* leaf spot of potato in Oregon, by F. D. Bailey and R. Sprague; heavy leaf rust (*Puccinia coronata*) infection of cereals in Georgia, by H. W. Rankin; *Cytospora kunzei* canker of spruce (*Picea* spp.), by A. M. Waterman; tree diseases in Massachusetts, by M. A. McKenzie; distribution of *Cephalosporium* and *Verticillium* on elm in Massachusetts (with map and tabulation), by E. M. Johnson; winter injury to tree and small fruits in Idaho (with tabulations of temperatures of weather stations), 1935–36, by E. C. Blodgett; effects of the autumn 1935 cold wave on forest trees in northern Idaho, and effect of early frosts on *Pinus monticola* in northern Idaho in 1935, both by R. K. Pierson and J. Ehrlich; and effects of the autumn 1935 cold wave on ornamentals in northern Idaho, by G. W. Woodbury.

No. 4.—Freedom from "yellows" of certain plantings of the Blakemore strawberry, by P. H. Millar; late fall damage to strawberries by leaf scorch (*Diplocarpon earliana*=*Mollisia earliana*), by G. M. Darrow and E. B. Morrow; corn ear rots in plats at the University of Illinois, 1936, by B. Koehler; a list of diseases found on economic plants on Staten Island (Richmond County), N. Y., from 1932 to 1936, by M. B. Linn; plant diseases observed in southern California in 1936, by H. G. MacMillan and O. A. Plunkett; and deciduous-seedling diseases in Midwest nurseries (including *Rhizoctonia* and *Pythium* isolates), by E. Wright.

[Plant disease work by the Florida Station] (*Florida Sta. Rpt. 1936, pp. 60, 61, 62, 64, 65, 80, 81, 82, 83–93, 94–96, 107–110, 113, 114, 134–137, 140, 141, 143, 153, 154*).—Reports of progress are included on "chlorosis" in corn and other field crop plants, by R. M. Barnette; bronzing or copper leaf of citrus, by C. E. Bell and R. W. Ruprecht; blackheart of celery, by E. R. Purvis and Ruprecht; development of strains of cowpeas and beans resistant to root knot, by J. R. Watson and H. E. Bratley; cold storage of citrus fruits (including control of stem-end rot and *Penicillium* mold), by A. L. Stahl and A. F. Camp; zinc as a corrective for frenching of citrus, by Camp; spectographic studies of the composition of tissues and corresponding soils of normal and physiologically diseased horticultural crops (including tabulations of the comparative zinc content of normal, diseased, and zinc-treated tung foliage, and of normal and frenched citrus foliage), by L. W. Gaddum, Camp, and W. Reuther; downy mildew (*Peronoplasmopara cubensis*) of cucurbits, by G. F. Weber; optimum time for setting strawberries in Florida, by A. N. Brooks; disease control in potatoes (including *Rhizoctonia* and *Sclerotinia* rot), and investigation and control of brown rot of potatoes and related plants caused by *Bacterium solanacearum* [*Phytomonas solanaceara*], both by A. H. Eddins;

investigation and control of fungus diseases of watermelons, including the wilt disease caused by *Fusarium niveum*, by M. N. Walker; so-called "rust" of *Asparagus plumosus*, by W. B. Shippy; control of tomato wilt (*Fusarium lycopersici*) in Florida, by Weber and D. G. A. Kelbert; *Clytocybe tabescens* mushroom root rot of citrus and other woody plants in Florida, by A. S. Rhoads; strawberry wilt or crown rot, by Brooks; tests of chemicals to check decay of citrus fruits in storage, by W. B. Tisdale and E. West; a bark disease of Tahiti lime trees, by Tisdale; *Sclerotium rolfsii* in Florida—its host relations and factors influencing its pathogenicity, by West; rose diseases in Florida and their control, by Shippy; fruit rots of grapes, by K. W. Loucks; virus diseases of tomato and pepper, by Brooks; and miscellaneous studies, including a cantaloup variety resistant to down mildew, citrus gummosis, and strawberry strain tests.

Progress reports are included of work at the Citrus Substation on melanose of citrus and its control, by G. D. Ruehle and W. A. Kuntz; die-back of citrus, by B. R. Fudge; citrus scab and its control, by Ruehle; and stem-end rot of citrus caused by *Phomopsis citri*, by Kuntz. Similar reports by the Everglades Substation include the seed- and soil-borne diseases and leaf blights of vegetable crops (bean, celery, lima bean, tomato, and potato), by G. R. Townsend; and nematode investigations, by J. R. Neller and A. Daane. Reports of work at the North Florida Substation include field and laboratory studies of tobacco diseases, and the developing of strains of cigar-wrapper tobacco resistant to black shank, both by L. O. Gratz and R. R. Kincaid. At the Subtropical Substation, work was conducted on bacterial soft rot of potatoes due to *Erwinia carotovora* [=*Bacillus carotovorus*], control of potato disease in Dade County, and control of tomato diseases by spraying, all by Ruehle.

[Phytopathological studies by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 336 (1936), pp. 26, 27*).—Brief reports are included on barberry eradication, by F. D. Kern and H. W. Thurston; mushroom diseases, by W. S. Beach; disease-resistant potatoes, by E. L. Nixon; and tobacco wildfire, by Beach and D. E. Haley.

[Plant disease work by the South Carolina Station] (*South Carolina Sta. Rpt. 1936, pp. 33–39, 93, 94, 126–130*).—The progress is herein noted relative to studies on cotton wilt, by G. M. Armstrong; cotton seedling diseases (including the germination of seed with reference to locality of origin, seed treatments, and varietal resistance to anthracnose), by C. H. Arndt; cucurbit diseases, by C. J. Nusbaum; spraying for tobacco downy mildew (blue mold) control at the Pee Dee Substation, by W. M. Lunn; and bean diseases and potato disease control tests (*Rhizoctonia* and late blight) at the Truck Substation, by W. D. Moore.

[Plant disease studies by the Utah Station] (*Utah Sta. Bul. 276 (1936), pp. 27–32, figs. 3*).—Progress reports are included on chlorosis control, with special reference to grapes, by F. B. Wann and A. L. Wilson; peach mosaic, differences in healthy curly top and bean-tomato tissues, and tomatoes grown in shade less susceptible to curly top, all by Wann; *Verticillium* wilt more responsible for tomato crop failures than *Fusarium* wilt, fermentation method of seed extraction for tomato bacterial canker control, and curly top highly destructive to beans and tomatoes, all by H. L. Blood; bacterial soft rot of dahlia due to *Bacillus carotovorus* [=*Erwinia carotovora*], the increase of bacterial wilt of alfalfa since its discovery in 1925, strawberry root rot as a definite limiting factor, and the nematode factor in diseased strawberry roots, all by B. L. Richards.

[Plant disease studies at the Wyoming Station] (*Wyoming Sta. Rpt. 1936, pp. 4–6, 26, 27*).—Progress reports are given on the following: Chlorosis of cottonwoods; varietal reactions to black stem rust of oats, wheat, and barley and to bunt of wheat; control of wheat bunt and scab; alfalfa strains resistant to bacterial wilt; seed treatment of beans, peas, and sweet corn with Semesan; and spraying for the control of purple top of potatoes.

A race of crown rust to which the Victoria oat variety is susceptible, H. C. MURPHY and M. N. LEVINE (*Phytopathology, 26 (1936), No. 11, pp. 1087–1089*).—In this cooperative study between the Iowa and Minnesota Experiment Stations and the U. S. D. A. Bureau of Plant Industry, this variety, resistant to some 37 physiologic races of *Puccinia coronata avenae*, is reported as susceptible to a recent collection made in Texas, which is here designated as a new race (key number 41). The reactions of the standard differential varieties to this race are tabulated.

At present, for every known parasitic race of rusts or smuts of oats, an oat variety fully resistant to such race is known.

Diseases and pests of our textile plants, K. FLACHS (*Nachr. Schädlingsbekämpf., 11 (1936), No. 1, pp. 6–28, figs. 13; Eng. abs., pp. [53, 54]*).—This is a general summary on the fungus and phanerogamic parasites, nonparasitic diseases, and insect pests of flax and hemp, including control methods. A bibliography is included.

[Phytopathological work at the Wyoming State experiment farms] (*Wyoming Sta. Bul. 219 (1937), pp. 36, 37*).—Progress reports are given on work with stem wilt of potatoes, potato storage as influenced by bin treatments, and spraying for purple top of potatoes.

Studies on the interfertility of four strains of Puccinia helianthi Schw., A. M. BROWN (*Canad. Jour. Res., 14 (1936), No. 10, Sect. C, pp. 361–367, pl. 1*).—"A distinct strain of *P. helianthi* was collected on each of the following four species: *Helianthus annuus, H. petiolaris, H. tuberosus*, and *H. subtuberosus*. All possible combinations of reciprocal crosses, haploid pustule with haploid pustule, and haploid pustule with diploid pustule were made among these four strains. Interfertile strains, when crossed, give rise to aecia in the formerly haploid pustules. On this basis, the strains fell into two groups: (1) The strains on *H. annuus* and *H. petiolaris*, and (2) the strains on *H. tuberosus* and *H. subtuberosus*. The two strains in each group were highly interfertile, but the two strains of one group were highly intersterile with the two strains of the other group. A parallelism exists between the crossing behavior of certain varieties of *P. graminis* and that of these two groups. It is suggested that each of these two groups of *P. helianthi* may represent a variety."

The longevity of smut spores in herbarium specimens, G. W. FISCHER (*Phytopathology, 26 (1936), No. 12, pp. 1118–1127*).—In this study by the Washington Experiment Station, 77 species of smut fungi, represented by 387 specimens, were tested for spore longevity. In all, 24 species (80 specimens) contained viable spores. In general, the Tilletiaceae retained viability longer than did the Ustilaginaceae. Some species in both families possessed great spore longevity under these conditions, the most noteworthy records being *Tilletia levis* 25 yr., *T. tritici* 18 yr., *Ustilago hordei* 23 yr., *U. avenae* 13 yr., *Sphacelotheca sorghi* 13 yr., and *U. bromivora* 10 yr. Considerable differences were noted in various collections of the same age and species. These are thought to be correlated chiefly with the degree of maturity at collection.

The isolation of a toxic substance from the culture filtrate of Trichoderma, R. WEINDLING and O. H. EMERSON (*Phytopathology, 26 (1936), No. 11, pp. 1068–1070*).—From liquid culture media on which an isolate of the fungus

T. lignorum had been grown, extraction with chloroform removed a gum and a crystalline substance, both highly toxic to *Rhizoctonia solani* and other fungi. By recrystallizing the latter substance from alcohol or benzene, it was obtained as white needles, analysis of which suggested the formula $C_{14}H_{16}N_2S_2O_4$, with the following determined constants—molecular weight 347, optical rotation $[\alpha]_D^{19°} = -239°$ in chloroform, and decomposition points after 3 recrystallizations from alcohol or benzene 219° and 222° C., respectively. The substance was much less soluble in water than in fat solvents. Sulfur was split out rapidly by boiling with aqueous KOH.

Virus studies, I, II (*Canad. Jour. Res., 14 (1936), No. 11, Sect. C, pp. 412–418, pl. 1*).—Two papers are included.

I. *The production of antisera in chickens by inoculation with potato X*, W. Newton and H. I. Edwards (pp. 412–414).—"Chicken antiserum was produced by three wing-vein inoculations with sap from *Datura meteloides* and *D. stramonium* plants infected with 'potato virus X.' Before injection, the saps were purified by the Bawden and Pirie method. This antiserum formed a conspicuous precipitate when incubated for 3 hr. at 37° C. with similarly purified sap of these two plant species when they were infected with the X or healthy potato virus, but failed to form any precipitate when incubated in the same way with purified sap from virus-free plants. Two unknown viruses, one from spinach and the other from tomato, were established as belonging to the X group by the precipitin reaction through the use of chicken antisera. The serological grouping was supported by the fact that the unknowns had similar, if not identical, lethal temperatures, longevities in vitro, and host ranges as the ordinary potato virus X."

II. *Streak X, a disease of tomatoes caused by a virus of the potato X group unassociated with tobacco mosaic*, W. Newton (pp. 415–418).—"A streak disease of tomatoes was found to be caused by a virus of the potato X group unassociated with tobacco virus 1. The disease markedly reduced the yield of marketable fruit in several greenhouses near Victoria. The symptoms resemble those induced by ordinary potato virus X in conjunction with tobacco mosaic. The host range, lethal temperature, longevity in vitro, and dilution extinction point of the virus resemble ordinary potato X. Streak X may be distinguished from ordinary potato X by the more pronounced symptoms it induces on tobacco, *Datura*, *Nicotiana glutinosa*, and tomato, and particularly by the streaking and necrosis of the stems and leaves of tomato. The virus causing this streak disease could not be recovered from Irish Cobbler potatoes after an incubation period of 10 days, neither did the characteristic symptoms occur on tomatoes already infected with the ordinary potato virus X. The virus was recovered unchanged from X-free potato seedlings. The antigen reaction also proved that the streak virus belonged to the potato virus X group."

The histology of the necrotic lesions induced by virus diseases, F. M. L. Sheffield (*Ann. Appl. Biol., 23 (1936), No. 4, pp. 752–758, pls. 2*).—It is shown that, in *Nicotiana glutinosa* inoculated with aucuba mosaic, after 12 hr. a yellow substance, readily taking dyes, forms in the walls of a few cells between the lower epidermis and spongy parenchyma, spreading outward and upward while mitoses without cell division occur in the spongy cells. After about 3 days this substance occurs in the walls of all cells in the necrotic area. The author feels that this material isolates the cells, causing their death and preventing the virus from passing into healthy parts.

The part played by auxin in the formation of internal intumescences in the tunnels of leaf miners, C. D. La Rue (*Bul. Torrey Bot. Club, 64 (1937), No. 2, pp. 97–102, fig. 1*).—The internal outgrowths discussed strongly

resemble certain intumescences often developed on the surfaces of leaves and stems, and they were experimentally induced on the exposed mesophyll of leaves of *Mitchella repens* and *Aster laevis* by fecal pellets from a number of insect larvae and from mice.

Oil sprays: Chemical properties of petroleum oil unsaturates causing injury to foliage, R. P. TUCKER (*Indus. and Engin. Chem., 28 (1936), No. 4, pp. 458-461*).—The data presented are believed to indicate that the hydrocarbons of petroleum oils are not toxic to foliage in a chemical sense until oxidized to oil-soluble asphaltogenic acids. The unsaturated hydrocarbons, per se, are thus no more toxic to foliage than are the saturates. The amount of asphaltogenic acids which an oil must contain to be injurious proved to be relatively small. It was indicated that the formation of asphaltogenic acids is roughly proportional to the percentage of unsaturated hydrocarbons in an oil.

Associations of microorganisms in relation to seedling injury arising from infected seed, J. J. CHRISTENSEN (*Phytopathology, 26 (1936), No. 12, pp. 1091-1105, fig. 1*).—The results of this study by the Minnesota Experiment Station indicate that the soil microflora has no marked effect on seedling blight arising from *Helminthosporium* or *Fusarium* infected barley seed. Addition of *Trichoderma lignorum* and several other fungi and bacteria to spontaneously infected barley seed or to sterilized and nonsterilized soil and soaking infected seed in an extract of these organisms failed to inhibit or delay the parasitic action of seed-borne parasites. However, addition of such organisms to seed or sterilized soil inoculated with *H. sativum* increased the stand, decreased the number of deformed and stunted plants, and suppressed the seedling injury.

Spontaneously infected barley seed is one of the primary sources of seedling injury in the State. Treating such seed with Ceresan improved the stand, decreased the seedling injury, and materially increased the plant vigor. Preliminary tests with New Improved Ceresan also gave good results.

A dangerous virus disease of turnip, rape, and rutabaga [trans. title], O. KAUFMANN (*Arb. Biol. Reichsanst. Land u. Forstw., 21 (1935), No. 4, pp. 605-623, figs. 10*).—This study considers the frequency and significance of virus diseases in the Cruciferae, the symptoms and course of the disease in question in the three hosts investigated, artificial transmission by the sap, the natural vectors (leaf aphids and *Lygus pratensis*), and the economic significance and geographical distribution of the disease.

Seed disinfection, II, III (*Jour. Agr. Sci. [England], 27 (1937), No. 1, pp. 43-52, 53-66, pl. 1*).—Continuing this series,[1] the two following papers are included.

II. *Large-scale field trials on the disinfection of seed corn with mercury dust disinfectants,* W. A. R. Dillon Weston, F. Hanley, and J. R. Booer.—It was found that bulk treatment of wheat, barley, and winter and spring oats with mercury dust compounds had no harmful effects when drilling followed the applications immediately nor in oats drilled 7½ weeks after. Wheat bunt and leaf stripe and net blotch of barley were effectively controlled.

III. *Experiments on the germination of peas—seed protection by the use of disinfectant dusts containing mercury,* C. C. Brett, W. A. R. Dillon Weston, and J. R. Booer.—The evidence adduced indicated that for sowings before March a suitable mercury dust compound gave an increased stand and yield, but the advantage for later sowings appeared doubtful. Apparently the chief value of the treatment lay in its protective action.

[1] Jour. Agr. Sci. [England], 25 (1935), No. 4, pp. 628-649, pl. 1, figs. 4.

Alfalfa stem nematodes (*Oklahoma Sta. [Bien.] Rpt. 1935–36, pp. 170–174, fig. 1*).—This is a brief, general account of the disease due to *Tylenchus dipsaci*, including studies by F. M. Rolfs and G. [E.] Tennyson.

The epidemiology and control of asparagus rust [trans. title], H. BREMER (*Gartenbauwissenschaft, 10 (1936), No. 1, pp. 51–73, figs. 5*).—As shown by 4-yr. tests with overwintering teliospores of *Puccinia asparagi*, the majority were dead at the time of primary infection, the average portion still viable being about one-fourth. Buried teliospores overwintered in higher percentages than those on the surface. Laboratory tests indicated that, within the limits of from 7° to 30° C. and from 27 to 100 percent relative humidity, the viability was higher the cooler and drier the environment. Neither by 3 weeks at from −3° to −20° nor by daily fluctuations from −6° to +11° over a 2- to 3-week period were the teliospores appreciably injured. From the author's results and a critical survey of the literature, it is concluded that no relations exist between the overwintering of teliospores and winter weather or between the severity of an epidemic and the reigning weather conditions at the time of primary infection, but that a warm, dry summer promotes the spread of the disease. One of the most important predisposing factors in the epidemiology of this rust is said to lie in the fact that primary infection foci always occur in young plantings and escaped plants, these being the plants most susceptible to infection at the time of teliospore germination. Thus every expansion of asparagus culture leads, in its earlier years, to an increase in rust, since under such conditions larger numbers of susceptible plants are present.

Variety tests over 2 yr. indicated that the American rust-resistant "Washington" varieties become infected later and less severely than ordinary varieties.

Diseases, and insect and other pests, of the field bean in New York, W. H. BURKHOLDER and C. R. CROSBY (*N. Y. State Col. Agr., Cornell Ext. Bul. 58, rev. (1935), pp. 38, figs. 22*).—This is a fully illustrated compendium of bean diseases and pests and their control in New York State.

Invasion of cotton seed by Bacterium malvacearum, G. TENNYSON (*Phytopathology, 26 (1936), No. 11, pp. 1083–1085, fig. 1*).—In this study by the Oklahoma Experiment Station, *B.* [=*Phytomonas*] *malvacearum* was found to enter the cottonseed at the chalaza through the intercellular spaces of the basal cap, and each of four tests gave evidence of the porosity of this cap. Inoculated seed showed bacteria in the tissue underneath the cap and in the intercellular spaces of its tissue. Bacteria-laden raindrops and rill water proved to be the principal sources of infection.

A method for the control of cotton root rot in the irrigated Southwest, C. J. KING (*U. S. Dept. Agr. Circ. 425 (1937), pp. 10, figs. 6*).—The method successfully used in Arizona "consists in burying liberal quantities of organic manures in deep furrows in infested areas during the winter, irrigating to encourage rotting, and planting cotton over the decaying material in the spring. The control is more efficacious with successive treatments and should be continued over a period of years in order to build up and maintain an abundant microfloral population in the soil. The root rot fungus [*Phymatotrichum omnivorum*] does not thrive in the presence of great activity on the part of saprophytic organisms, and the cotton plants frequently escape infection. The method should be applicable to row crops in any part of the irrigated region where root rot exists."

New biological and experimental data on the mole disease of mushroom beds [trans. title], J. CHAZE and A. SARAZIN (*Ann. Sci. Nat., Bot., 10. ser., 18 (1936), No. 1, pp. 1–85, pls. 3, figs. 9*).—This fungus disease, causing great losses

to the mushroom industry, is associated with *Mycogone perniciosa* and a small-spored *Verticillium*. In the present memoir the authors deal with the technic used in studying the malady, the morphology and cytology of the associated parasites and of the host mushroom (*Psalliota*) attacked, the culture of the parasitic fungi in various media, inoculation tests, the factors influencing infection, and the natural immunity of the host through the secretion of antibodies. The formation of antibodies by *Psalliota* is believed to be the first example of "humoral secretion" known in the fungi.

A review of the disease problems confronting the Nebraska growers of certified seed potatoes, R. W. Goss (*Nebr. Potato Impr. Assoc. Ann. Rpt., 17 (1936), pp. 6–14*).—Statistics collected by the University of Nebraska on the percentage prevalence in Nebraska of various potato diseases, as disclosed by two field inspections and one bin inspection made for certification purposes each year from 1931 through 1935, are presented in tabular form and discussed in the text. Rugose mosaic, unmottled curly dwarf, curly dwarf, and leaf roll were never prevalent or serious, probably due to lack of abundance of the insect vectors and the ease with which, when present, these diseases are detected and promptly removed by the seed-potato grower. Mild mosaic was more common but not serious. Spindle tuber is the most important virus disease in the State. *Fusarium* wilt and *Fusarium* root and stem rot are common and losses serious. Blackleg is not serious, and early blight is rarely of great importance except in individual fields, mostly in early plantings, irrigated. *Rhizoctonia* is common, and scab is present everywhere in varying severity. "Haywire", a trouble unusually prevalent in 1935, in which plants are severely dwarfed and rosetted, is discussed and the symptoms described. No methods of transmission except the inarch graft had proved successful, but there is a possibility that the trouble is a virus disease transmitted by some specific insect not very abundant in the State. Psyllid yellows was reported in 128 out of 506 fields inspected, constituting a serious problem.

Copper deficiency in sugar beets, D. A. van Schreven (*Phytopathology, 26 (1936), No. 12, pp. 1106–1117, figs. 2*).—Sugar beets of the Hilleshög variety were grown in water culture with and without addition of soluble copper (all chemicals previously twice recrystallized in double-distilled water). For comparison the white oat variety Zege was grown under the same conditions. In oats the very typical symptoms of reclamation disease appeared after 4 weeks. The beets without copper reacted very distinctly, after 19 days, with a light chlorosis beginning usually at the tips of the leaves and gradually spreading over the surface, which then presented a marbled appearance with the green veins showing prominently against a pale or yellowish-green background. Usually the outer leaves were most affected, the younger heartleaves remaining largely normal in appearance. After 2 mo. the chlorotic parts of the old leaves died, becoming gray, gray brown, or white.

Beets grown in the same solution plus copper were three times as large as in the copper-free solution. The ratio of weight of leaves to roots in diseased plants was 2.32, whereas in the healthy plants it was 0.83. The sugar content of affected beets was 15.2 percent and that of healthy beets 16.85 percent.

Evidently copper is essential to normal photosynthesis, as clearly shown by subjecting the leaves to the iodine-potassium test for starch. In this test the leaves of affected plants showed starch only along the leaf veins, while the healthy leaves showed its presence throughout.

A literature list of 47 titles is included.

Tobacco diseases (*Georgia Coastal Plain Sta. Bul. 26 (1936), pp. 97–101, fig. 1*).—General notes on tobacco diseases are followed by progress reports on

work relative to overwintering of tobacco mildew ("blue mold"), its control in hotbeds, and spray tests in beds and in the field; root knot control in plant beds; cultivation practices in relation to root knot control; and the effect of crop rotation on root knot (including 3-yr. rotations with individual crops, influence of length of rotation on root knot, and weed and forage crop rotations).

The relationship between the activity of tobacco mosaic virus suspensions and hydrion concentration over the pH range 5 to 10, R. J. Best (*Austral. Jour. Expt. Biol. and Med. Sci., 14 (1936), No. 4, pp. 323–328, fig. 1*).—Inactivation of the virus set in at about pH 7.8, and the fraction inactivated was progressively larger with increasing pH values until at pH 10.2 only about 0.5 percent of the virus added remained active. Between pH 8.0 and 8.9, corresponding, respectively, to 21 percent and 90 percent inactivation, the ratio $\frac{[H^+]^{\cdot}}{[\text{active virus}]}$ proved to be a constant, but this relationship failed to hold at pH values below 8. It is concluded that inactivation of the virus is associated with the neutralization of acidic groups.

The bearing of the results on the nature of the virus is discussed, and it is suggested that the groups thus neutralized form an integral part of the chemically reactive prosthetic groups of the virus.

Five years of tomato spraying, J. D. Wilson and H. A. Runnels (*Ohio Sta. Bimo. Bul. 184 (1937), pp. 13–18*).—With diseases absent or of minor importance, bordeaux mixture decreased the yield in 4 of the 5 yr. of trial, while in 1935, with early blight prevalent, the control afforded by the fungicides used increased the yield of treated plats over that of the controls. The addition of oil emulsion (a transpiration depressant) to bordeaux mixture (a transpiration accelerant) served to lessen the adverse effect on yield caused by the latter during the 2 yr. in which oil was used. An increase in the strength of the bordeaux mixture usually resulted in increased injury, and formulas high in hydrated lime and low in $CuSO_4$ proved more injurious than those with the proportions reversed. A number of copper-containing preparations of low solubility caused a smaller reduction in yield than bordeaux mixture. Copper oxychloride is apparently the most promising substitute for bordeaux mixture on tomatoes. The effects of various sprays on vegetative development of the plant were closely correlated with their effects on yield. Bordeaux mixture increased the amount of blossom-end rot over that on untreated plants during each of the 3 yr. when this disease assumed economic importance, whereas the oil emulsion decreased it.

Some chemical constituents of apple associated with susceptibility to fire-blight, A. A. Nightingale (*New Jersey Stas. Bul. 613 (1936), pp. 22, figs. 4*).—The preliminary experiments reported relative to the development of *Erwinia amylovora* [=*Bacillus amylovorus*] on extracted juice of apple trees of different growth status are believed to justify the conclusion that the relative concentration of carbohydrate and nitrogenous compounds in the host tissues and their balance with one another is of much greater importance in determining the development of the pathogen in the tissue than is the relative water content or the amount of resistance offered by the physical properties of the host cells. A relatively low carbohydrate, high organic nitrogen content was correlated with susceptibility, and the reverse with resistance.

The growth of *E. amylovora* in test tubes on agar made of the extracted juices from hard and soft trees of several apple varieties supported the results of greenhouse inoculations on trees receiving complete or nitrogen-lacking nutrient solutions. The organism grew well on agar made from succulent twigs,

low in carbohydrates and high in organic nitrogen, but poorly or not at all on that made from hard twigs, high in carbohydrates and low in organic nitrogen. Adding asparagine to the medium made from hard twigs favored the development of the bacteria, whereas adding sugar to agar made from the juice of soft twigs was unfavorable to their growth.

Soil conditions in relation to little leaf or rosette of fruit trees in California, A. Kozlowski (*Phytopathology, 26 (1936), No. 11, pp. 1041–1049, fig. 1*).—In this paper the author presents chemical and physiological analyses of water extracts from soils of affected orchards, and data on the physical condition, microbiological processes, and moisture relations of such soils in support of his previously published conclusion[4] regarding the origin of this disease. His experiments, taken as a whole, convinced him that the trees under investigation had become so weakened by unfavorable soil conditions that they could no longer resist attack by certain weak parasites found invading their roots and aerial parts. "After a very careful study of little leaf for nearly 2½ yr. the writer came to the conclusion that that disease is due not to a supposed single factor, which has not thus far been found, but to the concerted action of various factors, such as climate, soil conditions, and micro-organisms."

Apple powdery mildew, C. E. Berwith (*Phytopathology, 26 (1936), No. 11, pp. 1071–1073*).—In this study by the University of California, an optimum for germination of *Podosphaera leucotricha* conidia was indicated at from 19° to 22° C. and from 90 to 100 percent relative humidity. Infection took place at from 13° to 25°, with humidities near 100 percent.

Resistance to infection was found to increase with age of leaf but could be partially broken down by slight abrasion of the leaf surface. The appearance of the mycelium in the buds during winter suggests the probable survival in this form. Perithecia apparently play no part in the perennation of the fungus.

Sclerotium rolfsii as a disease of nursery apple trees, J. S. Cooley (*Phytopathology, 26 (1936), No. 11, pp. 1081–1083, fig. 1*).—*S. rolfsii* is reported as attacking apple nursery trees and girdling them at the collar. The fungus was readily observed and isolated in the early stages of the disease, but isolation studies indicated that it often dies soon after killing the host.

Anguillulina pratensis in relation to root injury of apple and other fruit trees, P. A. Ark and H. E. Thomas (*Phytopathology, 26 (1936), No. 12, pp. 1128–1134, figs. 4*).—Nematodes determined as *A. pratensis* were found in large numbers in roots of plum, peach, pear, and grapes, associated with little leaf disease. Injury was accompanied by necrotic spots on the fine rootlets, ranging from microscopic size to streaks several millimeters long. Infested roots were stunted and sometimes thickened and distorted. Numerous bacteria were associated with the nemotodes inside invaded tissues. It is concluded that besides the direct injury that must follow nematode invasion of the feeding roots there may be an absorption of preformed toxic material produced by the organisms external to the roots.

Water-table effects.—II, Relative incidence of diseases on stone-fruit trees, A. Fikry (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 154 (1936), pp. [2]+52, pls. 43, figs. 23*).—Continuing these studies (E. S. R., 72, p. 645), the growing of plum, peach, and apricot trees on plats with different soil and water-table levels, in which the soil was permeable and the water movement normal and free, indicated that a high subsoil water table renders the trees subject to gumming and death (a functional disorder) and to attacks of shot hole (*Clasterosporium carpophilum*), rust (*Puccinia pruni-spinosae*), and pow-

[4] Phytopathology, 25 (1935), No. 2, pp. 275–278.

dery mildew (*Sphaerotheca* [*pannosa*]) (on peach only). Varietal differences to the gumming disease among plums are noted, and peaches and apricots are said to be less affected than plums. Peaches were the most severely attacked by the shot hole fungus, and varieties of stone fruits differed in their susceptibility to the rust.

Infection studies with Sclerotinia fructicola on brushed and nonbrushed peaches, M. A. Smith (*Phytopathology, 26 (1936), No. 11, pp. 1056–1060, figs. 2*).—Infection of the nonbrushed surface of Elberta peaches occurred mainly via the hair sockets, the minimum period for infection being 8 hr. The most common method of infection of brushed fruit was via the broken hair sockets, the minimum infection time here being 4½ hr. Stomatal and direct infections were uncommon in either case. The rapidity of infection on the brushed fruit was apparently correlated with the relative susceptibility of the brushed fruit surface to germinating conidia.

A virus disease of prune, H. E. Thomas and E. M. Hildebrand (*Phytopathology, 26 (1936), No. 12, pp. 1145–1148, fig. 1*).—This new virus disease, found in New York, renders the trees virtually worthless commercially, although not inducing death. It is apparently distinct from any previously studied disease of plum or prune in North America. Affected leaves become reduced in size and distinctly narrowed, serration and pubescence are suppressed, and there is considerable rugosity and mottling. Ordinarily the shoot internodes become distinctly shortened. A variable number of apparently healthy and fruitful branches occur in diseased trees. Although diseased trees may bloom profusely, only occasional fruits develop on affected branches due to abortion of many of the pistils.

Transmission occurred by budding and grafting from prune to plum and prune but not to cherry or peach. Infection resulted even though none of the buds survived long enough to produce leaves, and the symptoms appeared about 1 yr. after inoculation. The virus apparently spread most rapidly upward, distinctly less rapidly downward, and very slowly laterally in the trees. Insect transmission tests with aphids (*Myzus mahaleb* and *Aphis setariae*) were unsuccessful.

Mesophyll collapse of citrus leaves, A. R. C. Haas (*Calif. Citrogr., 22 (1937), No. 3, p. 114, figs. 4*).—The leaf trouble discussed in this contribution by the California Citrus Experiment Station is often referred to as "blasting", and is characterized by yellow, translucent, and gray to brown, corklike areas, chiefly on the lower side of the leaves. The cause appears to be associated with an inadequate water supply, which may be aggravated by red spider or mite injury. Other contributory factors are enumerated. The symptoms have been induced by drying the soil to varying degrees prior to irrigating.

Endoxerosis of lemon fruits as affected by the application of different amounts of irrigation water, E. T. Bartholomew (*Phytopathology, 26 (1936), No. 12, pp. 1149–1154*).—Three groups of trees were grown in soil tanks with a moisture equivalent of 11 percent and a wilting point of from 3.5 to 4 percent. During the first period of the test the trees received like amounts of water, while during the second period they were not irrigated until the soil mass had reached a moisture content of from 6 to 8 percent in group I, from 5 to 6 percent in II, and from 4 to 5 percent in III. The results obtained substantiated previous evidence that withdrawal of water from the fruit during periods of excessive temperature and low relative humidity is an important factor in the production of endoxerosis.

A cytological study of Erysiphe polygoni on Delphinium, R. F. Allen (*Jour. Agr. Res. [U. S.], 53 (1936), No. 11, pp. 801–818, pls. 8*).—In this study by the California Experiment Station and the U. S. D. A. Bureau of Plant

Industry, the cytology and genetics of one of the powdery mildews is examined in the light of recent advances in other ascomycetes and in the basidiomycetes.

The cells of the vegetative mycelium of *E. polygoni* are long, straight, and uninucleate, and the hyphae showed no mutual attraction, though there was some evidence of cytoplasmic streaming through the septa. In sexual reproduction the hyphae swell toward each other, forming broad areas of contact. A nucleus may pass directly between hyphae, or communication may be established at the joined apexes or between short side branches of two hyphae. The opening between two fusing cells broadens rapidly, but there has been no indication that nuclear fusion occurs. Cell fusion is followed by growth with incomplete closure of the septa, resulting in chains of communicating cells or mazes which make up the bulk of the perithecium. These evidently sporophytic cells contain from one to several nuclei, and in their later growth the septa are completed and further cell divisions reduce the number of nuclei per cell.

When the perithecium is from 7 to 8 cells in diameter, the initial fusion cell and usually a few of the closely associated cells die. As the perithecium expands the cells of the inner wall grow centripetally, filling the central space. From the lower central area from 5 to 6 cells grow up to form asci, each ascus at first containing 2 nuclei, which soon fuse.

A bibliography of 60 titles is included.

The efficiency of baths used for the hot-water treatment of narcissus bulbs, L. N. Staniland and D. R. Barber (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 105 (1937), pp. 5+29, pls. 5, figs. 8*).—In studies over several years relative to the difficulties met with in the hot-water treatment of daffodil bulbs, the author found "that unsatisfactory results with bulb baths may be due to a number of different causes, all or any of which may be operating in any given instance. The factor that appears to have led most frequently to the survival of eelworms in treated bulbs is the use of sacks instead of rigid containers in the baths, but other factors such as inaccurate thermometers or incorrect steam pressures are little less important." Detailed results and recommendations are presented.

Thyrostroma compactum on Ulmus pumila, J. C. Carter (*Phytopathology, 26 (1936), No. 8, pp. 801–804, fig. 1*).—In May 1936, *T. compactum* was found fruiting on cankerous tissues of *U. pumila* in Illinois. Above the canker the tree was wilted. The development of the tubercles and characteristics of the conidiophores and conidia are detailed. Attempts to germinate the conidia on media and to isolate the fungus from diseased sapwood, bark, or tubercles failed, but its relationship to the canker was obvious.

A die-back of Douglas fir, A. M. Waterman and J. A. Miller (*Phytopathology, 26 (1936), No. 8, pp. 804, 805*).—In a planting of *Pseudotsuga taxifolia* on Long Island, an infection by a fungus identified as *Sphaeropsis ellisii* occurred in connection with a die-back of the new growth. A few neighboring trees of *Pinus nigra, P. strobus,* and *Picea pungens* were similarly affected.

The relation of the age of needles of Pinus strobus to infection by Cronartium ribicola, W. H. Snell (*Phytopathology, 26 (1936), No. 11, pp. 1074–1080*).—The results (1) of artificial inoculations of potted white pines, of older pines in their natural environment, and of young planted pines; (2) of the exposure of potted pines to spontaneous infection; and (3) of observations of cankers on young planted pines appear to indicate that the current season's needles are to a greater or less degree more susceptible to *C. ribicola* than the second season's needles.

It is suggested that in such studies the use of pines potted in the same season in which they are to be inoculated or exposed to infection may be open to criticism.

Progressive intensification of uncontrolled plant-disease outbreaks, S. B. FRACKER (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 923–940, figs. 12*).—The author's conclusions are "that the progressive intensification of white pine blister rust follows the same general type of development as that of human population and that there are several convenient ways in which it can be measured: (1) The rate of increase may be represented by *m* in the logistic curve used in studies of human population; (2) the extent of the gradual suppression of or increase in the *Ribes* population, the most important factor in the environment from the blister rust standpoint, can be determined by introducing appropriate coefficients to represent acceleration in the same population equation; and (3) the effect of the distribution of the *Ribes* in a given environment can be measured by finding out how many more cankers are present per tree in the stand, in view of the percentage of infected trees, than would be there if the *Ribes* were scattered uniformly among the trees."

Diseases of tung trees in Louisiana, A. G. PLAKIDAS (*Louisiana Sta. Bul. 282 (1937), pp. 11, figs. 6*).—The results of a preliminary survey of the diseases affecting tung trees in the State are presented. These include bacterial leaf spot (*Bacterium aleuritidos*); nut rot, probably due to *Dothiorella ribis* (=*Botryosphaeria ribis*); branch and twig cankers associated with *Dothiorella* sp.; crown girdle (cause unknown); intervenal browning and translucent spotting of the leaves, both probably nonparasitic in nature; and "white tree", characterized by the whitish appearance of the leaves and the lighter color of the bark and fruit (cause unknown). Bronzing and root knot have not been seen in Louisiana.

The biology of Pleurotus corticatus Fries, F. H. KAUFERT (*Minnesota Sta. Tech. Bul. 114 (1936), pp. 35, figs. 11*).—In *P. corticatus*, isolated from fire-scarred and decayed hardwood trees in the Delta region of Louisiana and Mississippi, binucleate conidia were formed on coremia which developed from the dicaryotic vegetative mycelium and abortive and fertile sporophores. Simple, binucleate conidia were also formed singly on the dicaryotic mycelium. Uninucleate conidia were formed on coremia on the haploid mycelia developing from single basidiospores. Simple conidia formed singly were also developed on the haploid mycelium. Numerous large sporophores capable of producing basidiospores were developed in culture. The sporophores proved very resistant to decomposition by molds or bacteria. For vegetative growth the optimum was about 27° C., and the most favorable medium used was malt agar.

When haploid mycelia from the same sporophore were mated, four types of reaction resulted, viz, compatible, neutral, antagonistic, and inhibitory. These are described, and it is stated that so far as known the inhibitory type has not hitherto been observed in other agarics. These experiments indicate the fungus to be heterothallic and tetrapolar. The diploidization of haploid by dicaryotic mycelia is described.

The dicaryotic mycelia caused the greatest decay of basswood blocks at a moisture content of 110–130 percent and rotted basswood sawdust more rapidly than haploid mycelia in tests of 90–150 days' duration. However, after 210 days the haploid mycelia caused as much decay as the parent dicaryotic or compatible matings of haploid mycelia. The antagonistic and neutral matings of haploid mycelia rotted basswood sawdust to the same extent as haploid cultures,

viz, about one-third to one-half as fast as the dicaryotic mycelia or compatible pairs of haploid mycelia. The inhibitory pairs of haploid mycelia rotted sawdust much more slowly, viz, only one-third as fast as the haploid mycelia and from one-seventh to one-eighth as fast as the parent dicaryotic cultures.

Coremia and conidia are formed on and in basswood blocks, thus supporting the theory that the fungus may be disseminated spontaneously by termites or other insects.

The feeding of hollow-spear nematodes on other nematodes, M. B. Linford and J. M. Oliveira (*Science, 85 (1937), No. 2203, pp. 295–297*).—In this study at the Pineapple Experiment Station of the University of Hawaii, the habit of preying upon nematodes was found well developed in the genera *Aphelenchoides*, *Dorylaimus*, *Discolaimus*, and *Actinolaimus*, all inserting the spear into their prey and sucking out through it the body contents. Larvae and eggs of the root knot nematode (*Heterodera marioni*) and larvae and adults of *Anguillulina pratensis* were attacked. About 13 species of dorylaims and 2 of *Aphelenchoides* were identified as predators. Prompt paralysis of the prey followed piercing by the spear. The sucking process and salivary flow are described.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Notes on economic insects and their control] (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 210–216, fig. 1*).—The notes presented (E. S. R., 76, p. 501) are as follows: Sugar Beet Leafhopper (*Eutettix tenellus* Baker) Appears in Illinois, by D. M. DeLong and K. J. Kadow (p. 210); Unusual Abundance of *Thyanta custator* (Fabr.) in South Dakota, by H. C. Severin (p. 210); Pyrethrins in Fresh Pyrethrum Flowers, by H. L. Haller (pp. 210, 211); Improved Device for Artificial Feeding of Aphids, by D. J. Pletsch (pp. 211, 212), contributed from the Minnesota Experiment Station; Dichloroethyl Ether for Wireworm [Sugar Beet Wireworm] Control, by R. E. Campbell and M. W. Stone (pp. 212, 213); Dichloroethyl Ether as a Control for Sod Webworms [*Crambus* sp.] in Lawns, by M. W. Stone and J. C. Elmore (p. 213); Preliminary Toxicity Tests With Horseflies, by D. MacCreary and A. M. Pearson (p. 214), contributed from the Delaware Experiment Station; High Infestation of *Prionus laticollis* Drury in Ohio, by C. R. Cutright (p. 215), contributed from the Ohio Experiment Station; Flight and Movement of Peach Borer Moths, by O. I. Snapp and J. R. Thomson, Jr. (p. 215); and A Scotch Pine Weevil, *Hylobius radicis* Buchanan, by K. E. Maxwell and G. F. MacLeod (pp. 215, 216).

[Report of work in entomology and economic zoology by the Florida Station] (*Florida Sta. Rpt. 1936, pp. 64, 65–69, 82, 114, 123, 124, 128, 129*).—The work of the year referred to (E. S. R., 75, p. 658; 76, p. 65) includes the Florida thrips *Frankliniella cephalica bispinosa* Morg., by J. R. Watson; the introduction and propagation of *Leis dimidiata* var. *15-spilota* Hope, by Watson and W. L. Thompson; the southern green stinkbug, leaf-footed bug, and *Acanthocephala* sp., by H. E. Bratley; the bean jassid, by A. N. Tissot; the green citrus aphid, by Thompson and Tissot; insects affecting pecan trees, by G. B. Fairchild and Bratley; control of the arbor vitae aphid, by J. W. Wilson; the onion thrips, by Watson; the gladiolus thrips, by Watson and Wilson; the biology and control of the Florida aphids, by Tissot; the pepper weevil, by C. C. Goff and Wilson; fumigation research for the cigarette beetle, by R. J. Wilmot; control of the purple scale and white flies with lime-sulfur, by Thompson at the Citrus Substation; and miscellaneous insect pests, with particular

reference to methods of control, prevalence and control of the sugarcane borer in south Florida, and prevalence and control of rodents under field and village conditions, all by R. N. Lobdell at the Everglades Substation.

[Work in entomology by the Maine Station] (*Maine Sta. Bul. 384 (1936), pp. 391–395, 401, 402, 427, 428, 430–434, figs. 3*).—Included in the work referred to (E. S. R., 75, p. 374) are insects affecting the apple crop, particularly the apple maggot, apple seed chalcid, and apple leaf-curling midge *Dasyneura mali* Kieff., by F. H. Lathrop, and canning crops, including the Mexican bean beetle and pea aphid, by J. H. Hawkins; control of the striped cucumber beetle, also by Hawkins; insects in relation to the transmission of virus diseases, by G. W. Simpson; and blueberry insects, including the blueberry fruitfly (*Rhagoletis mendax* Curran,[5] previously regarded as a blueberry race of *R. pomonella* Walsh), blueberry thrips *Frankliniella vaccinii* Morg., blueberry flea beetle, and blueberry spanworm *Itame argillacearia* Pack., by Lathrop.

Montana insect pests for 1935 and 1936, A. L. Strand (*Montana Sta. Bul. 333 (1937), pp. 39, figs. 8*).—In this report of the State entomologist (E. S. R., 72, p. 807), a discussion of grasshopper control both on cultivated lands and on the range in Montana, first presented, is followed by an account of other important insects of the biennium, including the pale western cutworm, Say's plant bug, beet webworm, various species of blister beetles with the spotted blister beetle predominant, the false chinch bug, fruit insects (the black cherry aphid, black cherry fruitfly, codling moth, oystershell scale, Vespidae, the pear slug, etc.), small fruit insects (the strawberry root weevil, strawberry leaf roller, and raspberry sawfly), the forest tent caterpillar, Virginia creeper leafhopper *Erythroneura comes ziczac* Walsh, and the alpine rock crawler *Grylloblatta campodeiformis* Walk.

[Work in entomology by the Oklahoma Station] (*Oklahoma Sta. [Bien.] Rpt. 1935–36, pp. 26–42, figs. 6*).—Following reference to the occurrence of the important insects of the biennium (E. S. R., 73, p. 71), brief reports are made of surveys to determine the incidence of the hessian fly; the finding of calcium arsenate as the most effective insecticide for the cotton leaf worm, the resistance of the boll weevil to near-zero temperatures, weevil resistance of cotton, and damage to corn by the corn earworm influenced by tightness of the husk, all by E. Hixson; grasshopper poisoning baits, by F. E. Whitehead and R. R. Walton; extermination of red harvester ants by means of carbon disulfide, by F. A. Fenton and L. E. Coe; value of sulfur as a diluent in insecticidal dusts, by Whitehead; chinch bug control and chinch bug resistance of sorghums as shown by quantitative tests, both by R. G. Dahms and R. P. Snelling; causes for periodicity of chinch bug outbreaks, by Fenton and Dahms; possibility of chinch bug control indicated by hibernation observations, by Dahms and G. A. Bieberdorf; sulfur as an effective insecticide for control of the common red spider on elms, by Fenton and Coe; need for revision of apple spray schedules under Oklahoma conditions, by Bieberdorf; life cycle of the flat-headed borer for determining the control method, by Fenton and M. Maxwell; danger of use of summer oil sprays for elms for scale control, by Fenton and Walton; and new facts about the transmission of anaplasmosis, by C. E. Sanborn, G. W. Stiles, Jr., and L. H. Moe.

[Work in economic zoology and entomology by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 336 (1936), pp. 37–39*).—The work of the year reported upon (E. S. R., 74, p. 366) relates to oil sprays and to the oriental fruit moth,

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[5] Amer. Mus. Novitates, No. 526 (1932), p. 7.

both by S. W. Frost; mushroom insects and the tomato pinworm (noted on page 73), both by C. A. Thomas; spray residues, by H. Frear and H. N. Worthley; and the codling moth, by Worthley.

[Work in economic entomology and zoology by the South Carolina Station] (*South Carolina Sta. Rpt. 1936, pp. 39–50, 85–93, figs. 3*).—The work of the year reported upon (E. S. R., 75, p. 78) includes the results of a faunal survey, by F. Sherman; work with the Mexican bean beetle, particularly as related to the value of rotenone as a control measure, by Sherman and J. N. Todd; methods of wintering bees, by D. Dunavan; studies of the oriental fruit moth, the southern cornstalk borer, and the rice weevil in corn, all by O. L. Cartwright, and of cotton insects, including thrips (especially *Sericothrips variabilis* (Beach)) on seedling cotton and the cotton flea hopper, by J. G. Watts; bollweevil and miscellaneous cotton insect investigations, including field poison tests, cotton root aphids (the corn root aphid, *Trifidaphis phaseoli* (Pass.), and *Rhopalosiphum* sp.), a contribution relating to which has been noted (E. S. R., 76, p. 508), cotton leaf aphids (the cotton aphid and the cowpea aphid), and several bollweevil parasites, by F. F. Bondy and C. F. Rainwater of the U. S. D. A. Bureau of Entomology and Plant Quarantine; and the relative toxicity of some insecticides to the tobacco flea beetle, by N. Allen, also of the U. S. D. A. Bureau of Entomology and Plant Quarantine.

[Work in entomology by the South Dakota Station], H. C. Severin (*South Dakota Sta. Rpt. 1936, pp. 25–27*).—The work of the year reported upon (E. S. R., 75, p. 658) includes grasshoppers of the subfamily Cyrtacanthacrinae of South Dakota; pollinating agents of sweetclover in South Dakota, with special emphasis upon seed production as influenced by the honeybee; and a study of the blister beetles (Meloidae).

[Work in entomology by the Utah Station] (*Utah Sta. Bul. 276 (1936), pp. 20–26, figs. 4*).—The work of the biennium 1935–36 reported upon (E. S. R., 72, p. 359) included the finding that the value of range lands is materially lessened by consumption of large quantities of forage by insects, by G. F. Knowlton; data on the importance of control of the pale western cutworm and the invasion of Utah by bands of the Mormon cricket, both by C. J. Sorenson; extensive damage by the pea aphid to canning peas, by Sorenson and Knowlton; the boxelder bug, a serious household pest, by Knowlton; serious damage to grain and alfalfa fields by Say's stinkbug and the early determination of dates for cover spray applications for the codling moth, both by Sorenson; the possibility of control of the beet leafhopper, by Knowlton; effective grasshopper control by poisoned bait, by W. W. Henderson; reduction in alfalfa seed production by the tarnished plant bug, by Sorenson; insect damage to berry crops, biological control of *Paratrioza cockerelli*, and the timing of control operations for tomato fruitworms, all by Knowlton; and further insect infestations, by Sorenson.

[Report of work in economic zoology and entomology by the Wyoming Station] (*Wyoming Sta. Rpt. 1936, pp. 10, 11, 17, 18*).—The work of the year in apiculture (E. S. R., 75, p. 85), dealing with wintering bees, use of 2 queens per colony, large v. small colonies for honey production, and a new culture medium for *Bacillus larvae*, and with tapeworms of sheep and rabbits (E. S. R., 75, p. 103) is referred to.

Observations on shade-tree insects and their control, E. P. Felt and S. W. Bromley (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 71–75*).—A continuation of the annual report of observations (E. S. R., 75, p. 663), in which the occurrence and control of shade-tree insects in 1936 are dealt with.

Symposium: Insects affecting man (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 9–71*).—The following contributions are presented: Mosquitoes and Their Control, by T. J. Headlee (pp. 10–17), contributed from the New Jersey Experiment Stations; Mosquito Control and Wildlife Conservation—Two Distinct but Sometimes Overlapping Systems of Processes in Human Ecology, by R. D. Glasgow (pp. 17–20); Mosquitoes and Malaria, by L. L. Williams, Jr. (pp. 20–26); Need for an Organized Research Program in Mosquito and Malaria Control, by F. C. Bishopp (pp. 27, 28); Myiasis of Man, by W. E. Dove (pp. 29–39); Notes on Forms of Myiasis, by O. R. Causey (pp. 39, 40); Some Therapeutic Uses of Insects and Their Products, by W. Robinson (pp. 41–48); Scientific Approach in Insect-Therapy, by W. A. Riley (pp. 49–51); Ticks of the United States in Relation to Disease in Man, by R. R. Parker, C. B. Philip, G. E. Davis, and R. A. Cooley (pp. 51–69); and Need for Research on Parasitic Mites, by R. Matheson (pp. 69–71).

Review of United States patents relating to pest control [January-December 1936], R. C. Roark (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Rev. U. S. Pat. Relat. Pest Control, 9 (1936), Nos. 1, pp. 6; 2, pp. 7; 3, pp. 8; 4, pp. 8; 5, pp. 10; 6, pp. 10; 7, pp. 10; 8, pp. 8; 9, pp 8; 10, pp. 11; 11, pp. 9; 12, pp. 8*).—A continuation of this series (E. S. R., 74, p. 665).

Methods and equipment for laboratory studies of insecticides, H. Waters (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 179–203, figs. 6*).—Report is made of a study of methods and equipment for rearing test insects and food plants under standardized conditions that can be maintained throughout the year. An efficient method for growing certain types of plants in trays under controlled conditions, an automatic method for watering these plants, methods for rearing several species of test insects, and several new types of insect cages were developed.

Studies on calcium arsenate, H. Waters and E. Witman (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 204–210, fig. 1*).—This contribution reports upon the determination of the factors involved in the formation of the so-called safe type of calcium arsenate and a method that was developed for making safe material on a commercial scale. A rapid laboratory test for arsenical injury to plants was developed and used extensively, and the comparative toxicity of the safe and ordinary types of calcium arsenate to several insect species was studied.

Homologs of paris green.—III, Members of the oleic and linoleic acid series, F. E. Dearborn (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 140–143*).—In continuation of earlier studies (E. S. R., 75, p. 514), the author reports that "crotonic, oleic, and erucic acids of the oleic series and linoleic acid of the linoleic series of fatty acids form definite complex compounds with copper and arsenic. The combining ratio of copper oxide to arsenious oxide is probably 4:3, the deviation from the theoretical value probably being due to the difficulty in purifying the compounds. From these conclusions the inference may be drawn that all the acids of the oleic and linoleic series of fatty acids form complex compounds of the general formula $3CuAs_2O_4 \cdot CuO$ (acid anhydride), similar to paris green."

Contact insecticidal properties of various derivatives of cyclohexylamine, C. W. Kearns and W. P. Flint (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 158–166, figs. 4*).—Tests of the insecticidal properties of 41 N- and N-N-substituted derivatives of cyclohexylamine, made on the aphid *Myzus porosus* Sand. and the common red spider, are reported upon. The relationship of toxicity to molecular structure is discussed in detail, and the relative toxicity of various closely related derivatives is represented by toxicity curves. N,N-amyl-benzoyl cyclohexylamine and N,N-amyl-acetyl cyclohexylamine were found to have exceptionally high contact insecticidal properties.

Relative toxic action of phenol and phenyl mercaptan, when the goldfish is used as the test animal, W. A. GERSDORFF (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 11, pp. 841–847, fig. 1*).—A study was made of the toxicity of phenol and phenyl mercaptan, the results being compared with each other and with those obtained with rotenone. Goldfishes weighing from 3 to 5 g each, and of the same lot, were used as test animals, observations being made at a constant temperature of 27° C.

"The phenolic solutions used were not so acid that the change in hydrogen-ion concentration was a factor to be considered. Phenol, like nicotine and anabasine, gives markedly skewed frequency distributions, in contradistinction to phenyl mercaptan and rotenone. The geometric mean defines best the position of the distribution in the case of phenol. It differs but little from the arithmetic mean in the case of phenyl mercaptan and rotenone.

"Phenyl mercaptan becomes toxic at much higher concentrations than rotenone (about 10 times as high), whereas phenol becomes significantly toxic (lethal within 3 days) at still higher concentrations than phenyl mercaptan (of the order of 40 times as high). Under the conditions of this study the threshold concentration of rotenone is about 0.04 mg per liter and that of phenyl mercaptan is about 0.4 mg per liter. That of phenol, however, cannot be approximated for comparison, since the initial acceleration of its velocity of fatality with increase in concentration is relatively slow.

"Phenol has a much more rapid toxic action than rotenone; its effect is immediately apparent, and there is practically no time tolerance at the higher concentrations. Phenyl mercaptan, although not wholly soluble at the higher concentrations required under the foregoing conditions, also has a rapid toxic action.

"All the compounds may be significantly compared quantitatively only at their regions of greatest toxic power, of which the minimum product of concentration and survival time is a measure. According to this criterion phenyl mercaptan is 7 times as toxic as phenol but only one-fiftieth as toxic as rotenone."

Variability in lead residues on apples, M. H. HALLER, C. C. CASSIL, and E. GOULD (*Jour. Econ. Ent.*, *30* (*1937*), *No. 1, pp. 174–179*).—In work conducted cooperatively by the U. S. D. A. Bureaus of Plant Industry and Entomology and Plant Quarantine and the West Virginia Experiment Station, 11 spray treatments were applied to Stayman Winesap apples. "Each spray treatment was replicated 3 times on adjoining or closely adjacent trees. The fruit from each replication was kept separate, and duplicate 30-apple samples were taken from each replication for the determination of lead residue at harvest. Additional analyses of duplicate 15-apple samples were made with certain of the lots after various washing treatments. Considerable variation was found to exist between determinations within spray treatments. Statistical examination of the data showed that variations between duplicate determinations within replicates, representing sampling and analytical errors, were relatively small and due in part to the size of the apple in the samples. Variations between replicates within spray treatments would represent differences due to the application of the sprays or to differences in the growth condition of the trees. The variation between replicates both at harvest and after washing was found to be quite large and not attributable to the size of the fruit. These variations introduce a serious error that should be taken into account in the comparison of spray treatments."

Nicotine in oil: A promising insecticide for horticultural purposes, P. O. RITCHER and R. K. CALFEE (*Jour. Econ. Ent.*, *30* (*1937*), *No. 1, pp. 166–*

solved in highly refined petroleum distillate gave promise as a horticultural spray. When correctly applied, it did not burn even tender plants and gave a high percentage of kill of many insects with piercing-sucking and chewing mouth parts. "It is concluded that 1 percent free nicotine in oil is suitable for field and greenhouse use with a minimum of discomfort to the operator and has a toxicity equivalent to 0.1 percent pyrethrum in oil. It was found possible to dissolve free nicotine in oil by two methods. The first is by adding 100 percent free nicotine directly to the oil. The second is by shaking commercial free nicotine products, such as 50 percent, with the oil base and then separating off the oil-nicotine from the settled water and impurities." It is pointed out that nicotine in oil must be applied to plants in the form of a fine fog to avoid plant injury. Several new applicators have been devised and are described, one of which, a new hand continuous atomizer, appears to have immediate commercial possibilities.

Derris and cube: Approximate chemical evaluation of their toxicity, H. A. Jones and C. M. Smith (*Soap, 12 (1936), No. 6, pp. 113, 115, 117, figs. 2*).—Reporting further (E. S. R., 73, p. 345), a method of calculating from the percentage of rotenone and of total extractives the approximate toxicity of samples of derris or cube root to houseflies is considered. "It gives a figure that expresses the insecticidal value of the root in terms of the toxicity of rotenone, by adding to the rotenone content a value for the effectiveness of the remainder of the extract. For derris root, using total extractive values obtained with carbon tetrachloride or benzene, the expression is: Toxic value equals rotenone content plus 0.5 (total extractive content minus rotenone content). If the acetone extract content is used, the factor 0.5 should be replaced by 0.4. For cube root the expression is: Toxic value equals rotenone content plus 0.4 (total extractive content minus rotenone content), and this holds for extracts obtained with any of the three solvents mentioned."

The optical rotatory power of extracts of derris and cube roots, H. A. Jones (*Jour. Agr. Res. [U. S.], 53 (1936), No. 11, pp. 831–839, figs. 3*).—Continuing his earlier studies (see above), the author found that values for rotenone equivalent to the combined optical rotatory powers of both acetone and benzene extracts of derris and cube roots gave an approximate measure of the insecticidal effectiveness of these materials to houseflies. Values calculated from the rotation of benzene extracts did not agree with toxicity so well as did the combined values, and in about half the samples results derived from the optical activity of acetone extracts were widely different from the toxicity values. The use of optical rotatory power is not recommended as a means of evaluation since simpler means of calculating the approximate toxic value are at hand. The results indicate that optically active constituents other than rotenone and deguelin were probably present in the samples tested. Dextrorotatory materials were undoubtedly present in some of the samples of derris root.

Toxicity of rotenone powders, D. G. Hoyer and M. D. Leonard (*Soap, 12 (1936), No. 3, p. 109*).—Attention is called to the work of Jones, Campbell, and Sullivan (E. S. R., 73, p. 345), which has shown that the total toxicity of rotenone-bearing root is greater than the amount of rotenone present would indicate, emphasizing the fact that other toxic extractives must be taken into consideration. It is pointed out that a more accurate method of comparing the toxic value of various rotenone-bearing roots is to determine the ratio between the percentage of rotenone and the percentage of total extractives present. The term "index of relative toxicity" is suggested for the figure thus obtained, it being considered a more accurate method of expressing the full toxic value of rotenone-bearing roots.

Rotenone powders, R. B. STODDARD (*Soap, 12 (1936), No. 4, p. 107*).—This is a critical discussion of the contribution by Hoyer and Leonard above noted.

Toxicity of rotenone powders, M. D. LEONARD and D. G. HOYER (*Soap, 12 (1936), No. 6, pp. 117, 123*).—A reply to the above.

[Contributions on termite control] (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 87–98*).—Contributions relating to termite control are: Problems in Termite Control, by D. M. Muirhead (pp. 87–91); Termite Control in Northeastern United States, by G. E. Sanders (pp. 92–94); and Relation of State Workers to Commercial Termite Control Companies, by N. Turner (pp. 94–98).

The field cricket as a pest of strawberries and its control, W. A. THOMAS and L. B. REED (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 137–140*).—The field cricket is a potential pest in the majority of the strawberry-producing areas in the Eastern States. In the North Carolina area it is responsible for a large percentage of the unmarketable berries that are found in the heavily infested fields. In addition, this pest often decreases the yield of fruit by feeding on the runner plants and on the developing fruit bud and blossoms. It can be controlled economically by the judicious use of poisoned baits during the early fruiting period or just prior to harvesting. The choice of poisons will depend on their availability, but calcium arsenate, sodium fluosilicate, and barium fluosilicate have given slightly better results than some of the other generally used insecticides. The choice of baits also will depend largely on their availability, but in the South, corn meal is available on practically every farm and is probably the most economical in this area.

Life history of the thrips parasite Dasyscapus parvipennis Gahan and the technic for breeding it, S. M. DOHANIAN (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 78–80*).—The thrips parasite *D. parvipennis*, first reported in 1923 from Java, where it was reared from the onion thrips along with *Thripoctenus brui* Vuil. and described by Gahan in 1927 as representing a new genus of the family Eulophidae, was reared from and reported, in 1927 and 1928, to be effective in controlling the red-banded thrips in the Gold Coast. It was introduced into Trinidad in 1935, where it became established, and from Trinidad into Puerto Rico in 1936. It is considered desirable that the parasite be introduced into the United States to combat the onion and the red-banded thrips, the latter occurring in Florida as an enemy of mango, jobo, and *Acalypha wilkesiana*. Notes on its life history, rearing, shipment, and liberation and recovery in Puerto Rico are included.

Cotton flea hopper control tests, using the Latin square plat arrangement and analysis of variance, J. C. GAINES (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 119–125*).—This contribution from the Texas Experiment Station deals with the Latin square method of plat arrangement for comparing materials used in control of the cotton flea hopper. The purpose of the investigation described was twofold, first, to determine if this plat or block arrangement, using small blocks, could be used in cotton-dusting control experiments, and, second, which material gives the best control of cotton flea hopper nymphs.

Recent insecticide experiments to control cotton flea hopper at Port Lavaca, Tex., K. P. EWING and R. L. MCGARR (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 125–130*).—In tests during the last 3 yr., derris root and cube root, in cage tests, gave practically no control of the cotton flea hopper, and other mixtures containing rotenone were also ineffective. "Pyrethrum dust containing 0.5 percent total pyrethrins was effective in killing adults (75 percent mortality) and was fairly effective against nymphs (57.7 percent mortality). The mixture of pyrethrum with sulfur increased the kill of nymphs but decreased the kill of adults. Phenothiazine was not effective in killing the cot-

ton flea hopper. Mixtures of paris green and sulfur, varying from 5 to 20 percent paris green, gave the most promising results in cage and field experiments. A mixture of 10 percent paris green and 90 percent sulfur gave better control of the cotton flea hopper than any other material used in field tests in 1935. Three cuts (where only two applications were made) produced an average gain of 220 lb. of seed cotton per acre over the checks. One experiment showed a gain of 596 lb. of seed cotton per acre from two applications of 10 percent paris green-sulfur and a net profit of $23.11 per acre."

Large-scale sulfur-dusting experiments for cotton flea hopper control at Port Lavaca, Tex., K. P. Ewing and R. L. McGarr (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 130–134*).—In experiments conducted in connection with those above noted, "fields of cotton ranging in size from 17.5 to 76 acres were dusted with sulfur for cotton flea hopper control on 10 farms in Calhoun County, Tex., in 1935. Adjoining untreated areas were left on each farm for comparison. On account of heavy rains early in June, only 2 of the experiments were started early enough to secure maximum control. Two to 4 effective applications of sulfur were made. The average amount of sulfur used per acre was 62.1 lb. The cost per farm ranged from $1.86 to $3.45 per acre, the average being $2.69 per acre. Average gain in production from the sulfur dusting in the large-scale experiments was 167.5 lb. of seed cotton per acre. This showed an average net profit of $4.75 per acre from the sulfur dusting. The highest profit on any farm was $11.86 per acre. Twenty-four 1-acre field plats were dusted with sulfur in 1935. An average of 5.7 applications were needed as compared with 3.3 applications in the large-scale experiments. The average gain in yield on the 1-acre plats was 127.8 lb. of seed cotton per acre and the average profit was $1.40 per acre, as compared with 167.5 lb. gain and an average profit of $4.75 per acre from dusting on the large-scale tests."

Adelges cooleyi Gillette (Hemiptera, Adelgidae) of the Douglas fir in Britain: Completion of its life cycle, A. E. Cameron (*Ann. Appl. Biol., 23 (1936), No. 3, pp. 585–605, pl. 1, figs. 3*).—Studies of *A. cooleyi*, a pest of Sitka spruce, the primary host, and Douglas fir, the secondary host, on the latter of which it has been known in Britain since 1913, are reported. Hitherto its life cycle in Britain has been regarded as incomplete because of the nonviability of generation I (sexuales) on Sitka spruce and consequent absence of the subsequent generation II (fundatrix vera) and generation III (gallicolae). Both of these generations have been discovered for the first time in Britain and their development followed.

The common rustic moth Apamea (Hadena) secalis L. attacking winter cereals, F. R. Petherbridge and I. Thomas (*Ann. Appl. Biol., 23 (1936), No. 3, pp. 649–652*).—Observations of the damage to winter cereals by the larvae of *A. secalis* are reported.

Damage to panicles of Alopecurus pratensis L. by Apamea secalis L., H. F. Barnes and S. P. Mercer (*Ann. Appl. Biol., 23 (1936), No. 3, pp. 653–657, pl. 1, fig. 1*).—A brief description is given of the moth and caterpillar stages of *A. secalis*, above noted, together with notes on its geographical distribution, life history, host plants, and economic importance. Its normal damage is due to the withering and death of the stems of the grasses owing to the caterpillars feeding within the sheaths.

Codling moth control with lead arsenate substitutes, S. W. Harman and T. W. Reed (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 82–86*).—The constant demand for lead arsenate substitutes to avoid the residue problem led the New York State Experiment Station to continue field tests with the more promising insecticides (E. S. R., 73, pp. 75, 651). Of the substitutes now available, calcium

arsenate used judiciously and certain of the fixed nicotine sprays have met with most success in New York State.

Observations on poison baits for corn ear worm control, L. P. Ditman (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 116–118*).—This contribution is based upon work reported in Maryland Experiment Station Bulletin 399 (E. S. R., 76, p. 831).

Seasonal availability of food plants of two species of Heliothis in eastern Georgia, G. W. Barber (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 150–158, fig. 1*).—In the southeastern coastal plain within a radius of 50 miles of Savannah, Ga., the larvae of the corn earworm were found to feed on 11 cultivated and 7 wild plants. Those of the tobacco budworm attacked 2 cultivated and 14 wild plants.

The tomato pin worm (Gnorimoschema lycopersicella Busck), C. A. Thomas (*Pennsylvania Sta. Bul. 337 (1936), pp. 15, figs. 3*).—This is a more extended account of studies of the tomato pinworm in Pennsylvania than that previously noted (E. S. R., 75, p. 519).

Upon hatching out from eggs deposited by the moths on the tomato leaves and fruit, the larvae mine into the leaves, stem, and fruit, distorting the leaves and reducing the market value of the fruit. They feed in the leaf mines until full grown, then drop to the ground and pupate in a light cocoon under clods or rubbish. The tomato pinworm also attacks the leaves of potato, eggplant, and horsenettle, but prefers tomato. It will not feed on greenhouse flowering plants.

The larvae are attacked by several parasites, but so far these have not been abundant enough to be of value. For artificial control, all or combinations of the following measures are said to help materially in reducing the numbers, or even in eradicating them, namely, rotation of crops, clean seedlings, leaf destruction, cleaning up between crops, field control by burning of plant remains and fall plowing, and insecticide treatments. It is pointed out that for the best results one tomato crop during a winter should be omitted if the pinworm is a problem in the locality, and that a successful outcome is dependent upon the cooperative effort of all growers.

A list of 27 references to the literature is included.

The Cotoneaster webworm, Cremona cotoneaster Busck, J. R. Roaf, R. E. Dimick, and D. C. Mote (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 134–136*).—An account is given of the life history, effect upon the host, and control of this new species of gelechiid moth attacking the ornamental shrub *Cotoneaster horizontalis*, as abserved by the Oregon Experiment Station at Portland and Corvallis in 1933 and 1934. The webworm is readily controlled by either contact or poison sprays such as lead arsenate, nicotine sulfate, and a rotenone-bearing dust. Thorough coverage and proper timing are important. The habit of the caterpillars of feeding upon either the upper or lower surfaces of the leaves necessitates a spray or dust coverage on both sides of the foliage. Also, the habit of the caterpillars of retreating into the refuge bases upon the slightest disturbance requires that the under sides of the branches be thoroughly covered when a nicotine sulfate spray is used.

Effect of moisture on emergence of the ragweed borer Epiblema strenuana Walker and its parasites, P. L. Rice (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 108–115, figs. 4*).—Contributing further from the Delaware Experiment Station (E. S. R., 73, p. 653; 76, p. 823), reference is made to an experiment conducted during 1936, in which two lots of approximately 20 larvae each were exposed to each of 19 different moisture treatments.

"An adult emergence of 100 percent resulted from the lots of insects which were soaked for 1 min. at weekly intervals throughout the season, while no

adults were produced in those lots which received no contact moisture or were not wet until very late in the season. The time and the number of wettings proved to be important factors in emergence. A marked reduction in the percentage of adults produced resulted when soaking of the insects was discontinued before the first of June or when this treatment was not started until July 1. The percentage of adults which emerged after a single soaking treatment applied during the first part of June (the time when ragweed borer pupation normally takes place) was twice as great as the percentages resulting from single treatments applied 3 weeks earlier or 3 weeks later. Transformation to the adult stage was delayed when contact moisture applications were started late. The minimum number of 1-min. wettings necessary to produce a high percentage of adult emergence was not determined. It is apparent, however, that several would be required. The maximum effect produced from one soaking was a 50-percent transformation to the adult stage.

"High humidity alone did not induce normal emergence. Only 1 insect out of the 41 periodically exposed to saturated humidity attained the adult stage. For the most part, lack of contact moisture arrests the development of the ragweed borer in the larval stage. More than 95 percent of the borers which failed to attain maturity died as full-grown larvae. Apparently, contact moisture influences development of the larval parasites of the ragweed borer. Definite conclusions in this particular cannot be drawn from the data presented."

Controlling borers of fruit, forest, and shade trees, L. Haseman (*Missouri Sta. Bul. 373 (1936), pp. 24, figs. 13*).—A practical discussion of methods for controlling borer enemies of fruit, forest, and shade trees.

Laboratory propagation of Compsilura concinnata Meigen, R. T. Webber (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 144–149*).—The tachinid parasite *C. concinnata*, one of the most important dipterans to be imported into the United States, has three or four generations a year and passes the winter as an immature larva in various species of lepidopterous pupae. The progeny of the second and third generations may either issue or overwinter. The need of a means for supplying the parasite in large numbers at the proper time led to its laboratory propagation, which has made possible the shipment of puparia from 2 to 4 weeks earlier in the spring and later in the summer than would be possible from field-collected material. Parasitization has been accomplished by individual handling, which has proved more dependable than any other method. Reproduction is possible on a large number of common host species, and populations can be built up easily during the season. The difficulty of insuring an abundance of overwintering material for liberation purposes was overcome by forcing the emergence of the overwintering stock and propagating this under laboratory conditions.

The biology of the chrysanthemum leaf-miner Phytomyza atricornis Mg. (Diptera: Agromyzidae), M. Cohen (*Ann. Appl. Biol., 23 (1936), No. 3, pp. 612–632, pls. 2, figs. 8*).—The synonymy and distribution of *P. atricornis* are first discussed. Its host plants are enumerated, and it is shown that the attacks on chrysanthemums decrease by August, although the flies are still common on other Compositae. A description is given, and comparisons are made of the morphology of the three larval instars, together with a discussion of the feeding of the larva. The puparium and emergence of the adult fly are also described, and an attempt is made to separate the puparia into sexes by measurement. Some degree of natural control is secured by the parasitism of a braconid on which a chalcid is probably hyperparasitic. A table in which the developmental period of *P. atricornis* and the chrysanthemum leaf miner are compared is included.

The biology of the apple curculio (Tachypterellus quadrigibbus Say), O. H. HAMMER (*New York State Sta. Tech. Bul. 240 (1936), pp. 50, figs. 17*).—Investigations of the biology and habits of the apple curculio that have been in progress since 1930 in the Lake Champlain fruit district in New York (E. S. R., 69, p. 246; 71, p. 355), where the insect is an important pest of apples, are reported upon. While it is generally distributed in the State wherever its native host plants (*Crataegus* spp. and wild crab apples) are found in abundance, it has become of economic importance only in the northeastern part.

Its injury to apple crops is caused by the early season feeding and oviposition activities of the overwintered adults and by the late season feeding of the new brood beetles. A marked preference has been shown for certain commercial apple varieties, although in the Champlain Valley none is immune to attack.

"There is only one brood of the apple curculio each year, and all development from egg to adult occurs inside the fruit. The insect passes the winter in the beetle stage, hibernating under leaves and other debris on the ground. Results of extensive hibernation studies indicate that most of the beetles overwinter under the trees which they infested the preceding summer. Emergence from hibernation begins in early May, and egg laying begins in late May or early June. The overwintered beetles die during the last week in June and the first 2 weeks in July. In general, the incubation period requires 6 days, larval development 19 to 20 days, and pupation 6 to 7 days.

"The new brood beetles begin to emerge from June drops during the second week in July. Emergence from growing apples, of which there is considerable, begins in early September. A few adults enter hibernating quarters in early August, and by September 30 they are practically all in hibernation.

"Studies of the dispersal of the apple curculio showed that certain environmental conditions are conducive to considerable spring migration. Data were obtained to show that the overwintered adults may travel more than 0.25 mile."

Seven species of insects have been found to be parasitic on the immature forms of the apple curculio in the Champlain Valley, namely, *Eurytoma tylodermatis* Ashm., *Entedon tachypterelli* Gahan, *Habrocytus piercei* Cwfd., *Zatropis incertus* Ashm., *Microbracon tachypteri* Mues., *M. mellitor* Say, and *Triaspis curculionis* Fitch. During the 5 yr. these studies were in progress, the maximum parasitism was 25 percent and the minimum 4 percent.

Parasites and predators of the Mexican bean beetle in the United States, N. F. HOWARD and B. J. LANDIS (*U. S. Dept. Agr. Circ. 418 (1936), pp. 12, figs. 3*).—The natural enemies of the Mexican bean beetle, termed *Epilachna varivestis* (*corrupta*) Muls. by Chapin (E. S. R., 75, p. 224), that have come to attention during the course of studies since its spread through the intensively cultivated areas of the United States are briefly considered. The spread of the pest is said to have continued practically unimpeded by these enemies.

Studies on the larvae of the native elm bark beetle, B. J. KASTON and D. S. RIGGS (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 98–108, figs. 7*).—In this contribution from the Connecticut [New Haven] Experiment Station the authors report upon the number of instars of the native elm bark beetle. While it was not found possible to determine the number of instars by measuring the head capsules of mixed lots of larvae taken at random from various localities in the field, if the measurements are considered separately by families the evidence indicates that some larvae of the *Hylurgopinus rufipes* go through six instars and some through five.

"A special device is described which allowed the daily observation of larvae

and duration of stadia were obtained for each larva. Six, 7, and perhaps 8 instars appear to be the usual number under these conditions, though in 1 family 9 to 12 occurred. There is a positive correlation between the number of instars and the duration of the entire larval period. The rate of tunneling was found to be quite variable with different larvae. Accompanying each ecdysis there is a period of almost a day during which the larva does not feed, and preceding pupation a period of about 3.5 days during which the tunnel is not lengthened."

Damage to wheat by Helophorus nubilus F., F. R. PETHERBRIDGE and I. THOMAS (*Ann. Appl. Biol., 23 (1936), No. 3, pp. 640–648, pl. 1, figs. 3*).—The beetle *H. nubilus* is recorded for the first time as a serious pest of wheat in East Anglia, slight injury having been recorded in 1922 and 1923. Observations made in a number of widely separated fields showed that the intensity of attack varies with the previous cropping, and that a serious attack occurs most frequently after ryegrass and clover.

Repellents for Japanese beetle, H. G. GUY and J. B SCHMITT (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 81, 82*).—A brief report is made of a limited field experiment at the Delaware Experiment Station undertaken in 1936 in which comparison was made of the repellent action of derris (at 3 lb.) plus various stickers, tetramethyl thiuram disulfide and tetramethyl thiuram monosulfide (at 4 lb.), and hydrated lime (at 20 lb. per 100 gal.). The results indicate that either tetramethyl thiuram disulfide or derris plus a rosin-type sticker offer considerable promise as Japanese beetle repellents.

The sweetpotato weevil and how to control it, K. L. COCKERHAM (*U. S. Dept. Agr. Leaflet 121 (1937), pp. 6, figs. 4*).—A practical summary of information.

Studies on European foul brood of bees.—II, The production of the disease experimentally, H. L. A. TARR (*Ann. Appl. Biol., 23 (1936), No. 3, pp. 558–584, pls. 3*).—In this second contribution (E. S. R., 75, p. 385) the results of a number of production experiments with European foulbrood are reported upon.

Attempts to cause disease by feeding the bees or larvae (without starving them) relatively large numbers of *Streptococcus apis* and *Bacillus alvei* organisms have as yet proved unsuccessful. "Whether this is due to the fact that these bacteria become attenuated with respect to virulence by culturing them on artificial media, or that decomposing brood acts as a vehicle and that the relative inoculum is greater by this method, remains to be determined.

"The failure to produce 'European foulbrood' by feeding sterile Pasteur-Chamberland L 2 or L 3 filtrates prepared from naturally infected larvae to the bees or larvae of healthy nuclei, either with or without bacteria, may be taken as strong evidence in support of the view that a filtrable virus is in no way implicated as an etiological agent in this type of disease. This conclusion is strengthened by the success which has attended the use of pure cultures of the bacteria associated with this disease employing the 'starved larvae' technic described. The introduction of queen bees from nuclei affected with European foulbrood into healthy queenless nuclei has not caused any transmission of the disease under the conditions of the experiments.

"Two species of *S. apis* Maassen have been isolated from affected larvae taken from several different cases of European foulbrood; one of these hydrolyzes both casein and gelatin, the other does not. In other respects these species appear to be identical."

It is concluded from this and earlier work that so-called European foulbrood may not be a single disease with one well-defined etiological agent as is

American foulbrood but is, perhaps, a nonspecific, mixed bacterial infection of the brood of bees, especially of the brood of weak colonies. However, this conclusion must be regarded as temporary pending further investigation. A list is given of 22 references to the literature.

Poisoning of honeybees by rotenone-derris dusts, R. S. Filmer (*Jour. Econ. Ent., 30 (1937), No. 1, pp. 75–77*).—Tests conducted by the New Jersey Experiment Stations, here briefly reported, indicate that rotenone dusts are as toxic to honeybees as the arsenical dusts, and that the use of rotenone-derris dusts on agricultural crops may be another serious source of poisoning to honeybees.

On the occurrence in England of the pear fruit saw-fly Hoplocampa brevis Klug., I. Thomas (*Ann. Appl. Biol., 23 (1936), No. 3, pp. 633–639, pl. 1, figs. 3*).—Although *H. brevis* has been a serious enemy of pears in some continental countries, it is recorded for the first time as a source of injury in England, having been found attacking pears in two gardens in Cambridge. Brief reference is made to a preliminary study of its biology, with descriptions of its immature stages.

Further experiments on the control of the hop red spider mite Tetranychus telarius L., S. G. Jary (*Ann. Appl. Biol., 23 (1936), No. 3, pp. 606–611*).—In further small-scale experiments with a number of spray fluids to combat the common red spider on hops (E. S. R., 74, p. 675), "lime sulfur at a concentration of 1:80 proved very toxic to the mites, but a second application had to be made to deal with those which hatched subsequently from eggs. Emulsions of a 'water white' petroleum oil at 2- and 1-percent concentrations were very toxic to the mites but caused marked edema. Whale oil-potash soap at 1- and 0.5-percent concentration; cottonseed oil emulsion, 6 pt. of oil per 100 gal. of wash; derris extracts of 0.005 percent rotenone and 0.002 percent rotenone content; and a pyrethrum extract of 0.0025-percent content of pyrethrins I and II were all without appreciable toxic effect upon the mites. Lime-sulfur at 1:80, to which a wetter of the sulfonated lorol type was added, proved successful in the field for the control of *T. telarius* on hops. No injury to the plants resulted from the use of bordeaux mixture on the same plants."

ANIMAL PRODUCTION

Feeds and feeding, F. B. Morrison (*Ithaca, N. Y.: Morrison Pub. Co., 1936, 20. ed., pp. VI+1050, pls. 95, figs. 4*).—The twentieth edition of this well-known text (E. S. R., 48, p. 660) retains essentially the same arrangement as earlier editions, but has been entirely rewritten and considerably enlarged. The extensive appendix tables have been revised, and all information on the average composition and the content of the digestible nutrients and mineral and fertilizing constituents of important American feeding stuffs brought together into a single complete and convenient table.

[Investigations with livestock in Florida], A. L. Shealy, W. M. Henley, W. M. Neal, R. B. Becker, O. D. Abbott, R. W. Kidder, L. O. Gratz, W. F. Ward, W. G. Kirk, N. R. Mehrhof, E. F. Stanton, and M. W. Emmel (*Florida Sta. Rpt. 1936, pp. 50, 51, 52, 54–56, 57, 70, 138, 139, 143, 144, 145, 146, 155, 156, 158–161, fig. 1*).—The results obtained in tests with beef cattle are reported on the use of purebred sires with native cows for grading up herds of cattle; dried grapefruit refuse and fresh cannery run refuse for steers; the efficiency of the trench silo for preservation of forage crops as measured by utilization of the nutrients of the silage by cattle; beef and dual-purpose cattle investigations at the Everglades Substation; the feeding value of sorghum silage,

peanut hay, and cottonseed hulls as roughages in fattening steers at the North Florida Substation; and beef and dual-purpose cattle studies at the West Central Florida Substation.

Swine studies yielded results on a comparison of Spanish peanuts and other grazing crops with dry-lot feeding for pork production, fattening fall pigs for spring market, deficiencies of peanuts when used as a basal ration for swine; and comparisons of gains made by swine on various grazing crops, and fattening fall pigs for the spring market at the North Florida Substation.

A comparison of the adaptability of Columbia and native sheep was made at the North Florida Substation.

In tests with poultry, information was obtained on lecithin synthesis in hens on a vitamin A- and lipoid-free diet; a comparative study of corn and liquid milk v. a grain and mash ration in feeding for egg production; a comparative study of the value of meat scrap, fish meal, and milk solids as sources of protein for egg production; lights v. no lights for egg production on Single Comb White Leghorn pullets and hens; and at the West Central Florida Substation on the use of peanuts and peanut products in rearing turkeys; confinement v. range rearing of chicks; importance of range rotation in poultry production; egg production and mortality of pullets reared under confinement v. range conditions; comparative study of the value of milk solids, ground peanuts with hulls, meat meal, and fish meal in fattening broilers and fryers; and all-night lights v. no lights on Single Comb White Leghorns.

[**Investigations with livestock in Georgia**] (*Georgia Coastal Plain Sta. Bul. 26 (1936), pp. 38–59, figs. 3*).—Continuing pasture investigations (E. S. R., 75, p. 238), data are reported on the returns secured by beef cattle from both lowland and upland permanent pastures, and various temporary grazing crops including kudzu, *Lespedeza sericea*, oats followed by common lespedeza, Austrian winter peas, hairy vetch, and oats followed by Sudan grass, soybeans, and cattail millet. Beef cattle studies gave information on the production of veal calves and feeder calves, wintering feeder calves, rations for fattening steers, improvement of stock through the use of purebred bulls, and use of a trench silo. Results are noted on the feeding and management of spring and fall litters of pigs.

[**Investigations with livestock in Oklahoma**] (*Oklahoma Sta. [Bien.] Rpt. 1935–36, pp. 69, 70, 77–97, 141–163, figs. 2*).—Beef cattle studies yielded results on the comparative cost of finishing creep-fed v. noncreep-fed calves, by L. E. Hawkins, O. S. Willham, and B. R. Taylor; a comparison of prairie hay, alfalfa hay, cottonseed hulls, and kafir silage as roughages in the fattening ration of steer calves, by W. L. Blizzard; and the management of native pastures, by Blizzard, Hawkins, and B. F. Kiltz.

Swine studies reported include the value of grinding wheat and kafir for hogs, by C. P. Thompson; the influence of protein intake on reproduction, by Thompson and W. McMillan; and inbreeding v. outcrossing in swine production, by W. A. Craft and Willham.

Results of sheep tests are noted on the comparative value of alfalfa hay, prairie hay, and wheat pasture for fattening lambs, by Willham and H. F. Polson; the influence of nutrition on the physiology of reproduction in sheep, by A. E. Darlow and Hawkins; and methods of curing lamb, by J. A. Beall and D. I. Purdy.

Poultry studies gave results on the value of dried grasshoppers in turkey feeding, by L. Morris; an inexpensive evaporation cooler for preserving eggs over short periods, by R. B. Thompson and C. Roberts; the effect of forcing breeding hens on hatchability, low protein v. high protein for egg production,

and the influence of fiber in the ration of chicks, by R. Penquite; capon production from low cost chicks, by Penquite and Roberts; the influence of time of hatching on young and adult characteristics, by Morris and Thompson; soybeans for laying hens, and feeding for egg yolk color, both by Thompson; the incidence and prevention of perosis and the influence of variety, dam, and sex on weight and feathering of broilers, both by Penquite and V. G. Heller; crossbreeding studies, by R. G. Jaap and Morris; and feed and egg costs since 1929, by F. Z. Beanblossom.

Nutrition studies gave results on the hair loss in albino rats due to gossypol, and various supplements to cottonseed meal for laboratory animals, both by W. D. Gallup and R. Reder.

[Livestock investigations in Pennsylvania] (*Pennsylvania Sta. Bul. 336 (1936), pp. 23–25, 26, 35–37, fig. 1*).—Results of experiments with livestock are reported on digestion coefficients of feeds for cows and sheep, by E. B. Forbes et al.; the utilization of energy-producing nutriment and protein as affected by individual nutrient deficiencies (the effects of the plane of protein intake), by Forbes, R. W. Swift, A. Black, and O. J. Kahlenberg; hothouse lamb production, by W. L. Henning, P. T. Zeigler, and P. C. MacKenzie; curing pork on the farm, by R. C. Miller and Zeigler; and sweetclover and rape for swine, by T. B. Keith and M. A. McCarty.

Reports of poultry tests include factors affecting quality in eggs, by J. E. Hunter, D. R. Marble, and W. J. Rudy; the relation of nutrition to perosis in poultry, by Hunter and H. C. Knandel; the nutrition of turkeys, by Marble and Hunter; breeding for increased livability, by Marble; and the propagation of ring-necked pheasants, by E. W. Callenbach, Hunter, and R. R. Murphy.

[Livestock investigations in South Carolina] (*South Carolina Sta. Rpt. 1936, pp. 51–54, 61, 69–72*).—Results of experiments under the leadership of E. D. Godbey, L. V. Starkey, E. D. Kyzer, and T. M. Clyburn are briefly reported on methods of feeding cottonseed meal and hulls to fattening steers, the effect of the ration on the quality of beef produced, flax husks v. cottonseed hulls in the ration for wintering beef cattle, rye v. sorghum silage for wintering yearling steers, creep-feeding beef calves, the effect of various treatments on the beef-producing capacity of Coastal Plains pastures, a comparison of summer forage crops for fattening hogs, protein supplements for fattening hogs when grazed on rye forage, the inheritance of the early lambing character, and breed performance in early spring lamb production.

Poultry studies by R. C. Ringrose, C. L. Morgan, and J. H. Mitchell gave results on factors affecting the physical quality of eggs, and the balance between intake and outgo of certain elements in the nutrition of the hen.

[Investigations with livestock in South Dakota] (*South Dakota Rpt. 1936, pp. 11, 12, 13, 14, 34–37, 38–43*).—Information obtained in a test on the value of protein supplements for fattening beef steers, by J. W. Wilson, is reported.

From swine tests results are noted on the use of proso for fattening pigs, the feeding value of low-grade barley, and rations for spring pigs after weaning, all by Wilson.

Poultry studies yielded data on the value of corn, oats, and millet grains in poultry rations; alfalfa leaf meal as a vitamin A supplement to red proso millet and amber cane; the relative values of common grain varieties and their effects upon egg quality and poultry carcass quality; ground wheat as a substitute for bran and middlings; the utilization of corn, wheat, oats, and barley in turkey rations; turkey egg hatchability; and the practicability of caponizing cockerels in South Dakota, all by W. E. Poley.

[Experiments with livestock in Utah] (*Utah Sta. Bul. 276 (1936), pp. 11–19, figs. 3*).—Tests with beef cattle under the leadership of E. J. Maynard, H. H. Smith, J. E. Greaves, R. J. Becraft, and L. A. Stoddart gave information on the influence of calcium-phosphorus ratios on the rate and economy of gain in fattening cattle, the occurrence of phosphorus deficiency as the cause of low gain in summer range cattle, and phosphorus supplements for sugar beet byproducts rations.

Sheep studies reported include the use of sugar beet molasses and corn silage in lamb rations, and corn and cottonseed cake as supplements for wintering sheep on desert range, both by Maynard and A. C. Esplin; and the effect of locality and management on the production and shrinkage of wool, by Esplin.

From swine studies the relative values of tankage, skim milk powder, and semisolid skim milk proteins for fattening swine when fed with ground barley or ground wheat in dry lot and on alfalfa pasture are reported by Smith and Maynard.

Poultry studies gave results on the desirability of forced summer molt in Leghorn hens, optimum levels of animal protein supplement in the laying ration, and the comparative values of soft white wheat v. hard red wheat and barley v. corn for hens, and the costs of feeding turkeys, all by B. Alder.

[Livestock investigations in Wyoming] (*Wyoming Sta. Rpt. 1936, pp. 7, 8, 9, 11, 21, 22, 24, 26, 28, 29*).—Results are noted from studies with sheep on the wool production and market value of lambs resulting from crossing grade fine wool ewes with purebred rams of different breeds; a comparison of alfalfa, Sudan grass, and crested wheatgrass hays in the winter ration of lambs at the Gillette Substation; lamb feeding tests at the Torrington Substation; and the carrying capacity of sweetclover pasture for lambs and ewes, and beet pulp and beet tops in the lamb ration, both at the Worland Substation.

Other livestock studies reported include calcium and phosphorus supplements for beef cattle at the main station, and a comparison of grain rations for hogs at the Lyman Substation.

Poultry studies yielded information on the relation of pauses in winter egg production to the number and size of eggs produced, the use of rye in the chick ration, the use of soybean meal as a partial substitute for meat meal in the chick ration, the relation of the shape of roosts to breastbone deformity in turkeys, and cod-liver oil, alfalfa meal, and long alfalfa as supplements to a basal ration for pullets. Chemical studies gave information on the calcium and phosphorus content of Russian-thistles, sagebrush, willow leaves, grasses, rushes, and sedges.

[Livestock investigations at the Wyoming State experiment farms] (*Wyoming Sta. Bul. 219 (1937), pp. 20, 24, 26, 27, 33, 34, 39, 40, 43, 45*).—Sheep studies are reported from the Gillette Substation on the value of Sudan grass and alfalfa in home-grown rations for lambs, from the Sheridan Substation on a comparison of crested wheatgrass and native grass pasture for sheep, and from the Worland Substation on the returns secured from grazing sheep on alfalfa and on an improved permanent grass pasture, and self-feeding v. hand-feeding of concentrates to lambs in relation to death losses from heavy concentrate rations. Swine tests are reported from the Lyman Substation on a straight barley ration v. a barley (60) wheat (40) mixture for fattening pigs, and the value of skim milk as a supplement to a mixture of barley and oats, and from the Sheridan Substation on pasture feeding v. dry-lot feeding for fattening swine. Studies in progress at the Torrington Substation include the use of beet byproducts and soybean meal for fattening rations

for steers, feeding lambs entirely in panels, dipping lambs for ticks, and experiments with poultry on lights for egg production, milk for growing chicks, and vitamin supplements for laying hens.

U. S. graded and stamped meat (*U. S. Dept. Agr. Leaflet 122 (1936), pp. 7, figs. 9*).—This is a brief description of the methods employed in grading and stamping meats under the Government meat inspection service, with a list of official grades for beef, lamb and mutton, and veal.

The utilization of energy producing nutriment and protein as affected by sodium deficiency, O. J. KAHLENBERG, A. BLACK, and E. B. FORBES (*Jour. Nutr., 13 (1937), No. 1, pp. 97–108, fig. 1*).—Continuing earlier work[6] the Pennsylvania Experiment Station has compared a sodium-deficient diet (0.007 percent of sodium) and a sodium-supplemented diet (0.502 percent of sodium) by means of a 10-week growth, metabolism, and body analysis study with 12 carefully selected pairs of young albino rats, with feed intake carefully controlled by the paired method.

No significant differences were noted between the two groups in the digestibility of protein, digestibility or metabolizability of the energy-producing nutrients, or body moisture content. The sodium-deficient ration unfavorably affected the appetite, the increase in weight, the storage of energy, and the synthesis of fat and protein, and resulted in significantly higher heat loss. Animals on the supplemented diet stored a larger amount of energy as fat and also stored decidedly more sodium in their bodies than pair mates on the deficient diet. At the same level of feed intake the supplemented diets supported average gains of 0.9 g per rat daily, which was approximately double that secured on the deficient diet.

The response of rats, chicks, and turkey poults to crystalline vitamin G (flavin), S. LEPKOVSKY and T. H. JUKES (*Jour. Nutr., 12 (1936), No. 5, pp. 515–526, figs. 6*).—In experiments at the California Experiment Station young rats, chicks, and turkey poults were fed on highly purified synthetic basal diets adequate in all respects except vitamin G (flavine). The rats fed on such diets ceased to grow and developed a type of dermatitis adjudged as definitely different from that due to vitamin B_6 deficiency (E. S. R., 72, p. 282). Later symptoms were loss of weight, gastro-intestinal disturbances, diarrhea, and finally death. The addition of from 10 to 20 µg (micrograms) of crystalline vitamin G to the daily diet following the appearance of dermatitis and diarrhea caused immediate improvement and a return to normal appearance in 20 days, although diarrhea frequently persisted and growth was irregular. The vitamin G deficiency in chicks was marked by slow growth, diarrhea, emaciation, and poor utilization of feed, but without evidence of a dermatitis. The addition of 2 mg of lactoflavine per 100 g of diet permitted fair growth and increased the efficiency of feed utilization. Vitamin G deficiency in turkey poults resulted in an acute dermatitis in spite of an abundance of the "filtrate factor" (E. S. R., 75, p. 681) which prevents dermatitis in chicks. Other symptoms in the poults were similar to those observed in chicks. The addition of 2 mg of lactoflavine per 100 g of ration prevented the occurrence of dermatitis and permitted rapid growth. These results are discussed in relation to previous investigations of the vitamin B complex.

The relative vitamin G content of alfalfa meal, H. S. WILGUS, JR., L. C. NORRIS, and G. F. HEUSER (*Poultry Sci., 15 (1936), No. 6, pp. 446–453*).—Employing the method of assay as previously noted (E. S. R., 74, p. 682), the

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[6] The utilization of energy producing nutriment and protein as affected by individual nutrient deficiencies.—III, The effects of protein intake. E. B. Forbes, R. W. Swift, A. Black, and O. J. Kahlenberg. Jour. Nutr., 10 (1935), No. 5, pp. 461–479.

[New York] Cornell Experiment Station has determined the vitamin G potency of numerous samples of alfalfa meal, representing varying stages of maturity, curing conditions, and market grades, and has calculated the degree of correlation between the vitamin G potency and grade, protein, ether extract, and fiber analyses.

The average growth-promoting vitamin G content of sun cured and artificially dried alfalfa meals averaged approximately 60 percent and 85 percent, respectively, of that in dried skim milk, although considerable variation occurred in both types of meals, particularly the latter. Neither the percentage of leafy material, protein, ether extract, nor fiber in the meal was sufficiently correlated with vitamin G to establish them as reliable measures of vitamin G potency. In general, meals having a high percentage of leaf, protein, and ether extract and a low fiber content should tend to have a high vitamin G potency.

Factors which may affect the hardness of cottonseed cake, G. S. Fraps and C. D. Marrs (*Texas Sta. Bul. 534 (1936), pp. 27, figs. 2*).—Continuing the studies on the hardness of cottonseed cake (E. S. R., 75, p. 236), certain factors in the composition and manufacture of the cake have been investigated in relation to the hardness of the product. Specimens from a single slab of cottonseed cake varied from 2,600 to 3,500 lb. in crushing strength, and no constant regions of hardness or softness were evident, hard spots and soft spots occurring in both the central and end portions of the slab. No definite relations were found between the chemical composition and hardness of the cake, although the fat content seemed to exert a slight influence in this respect. A pronounced and rapid change of moisture content of the cake (either an increase or a decrease) caused a lowering of the crushing strength. Unpressed meats of high moisture content and the use of relatively high temperatures in the press boxes each seemed conducive to soft waxy cake. Storage in a dry place for approximately 2 yr. did not increase the hardness of the product. The crushing test, as previously noted, was found to be a satisfactory measure of hardness, but a modified Brinell, schleroscope, abrasion, and impact tests each proved unsuitable. The rate of application of the crushing load had no apparent effect on the results, but the direction of the application of the testing load and the degree of smoothness of the test specimen each had considerable effect on the apparent hardness of the cake.

The digestibility of perilla meal, hempseed meal, and babassu meal, as determined for ruminants, A. H. Folger (*California Sta. Bul. 604 (1937), pp. 8*).—Continuing the study of the feeding value of feeds recently introduced on the market (E. S. R., 71, p. 822), the digestibility of the three above-named feeds has been determined in digestion trials with wether sheep. Perilla meal proved fairly palatable, contained degestible crude protein 34.1 percent and total digestible nutrients 63.8 percent, and tended to solidify in the bag after short storage periods. Hempseed meal proved rather unpalatable, and considerable time was required in accustoming the sheep to it. A digestible crude protein content of 26 percent and a total digestible nutrient content of 43.8 percent was indicated. Babassu meal, readily consumed by the sheep, had a digestible crude protein content of 21.3 percent and a total digestible nutrient content of 79.7 percent.

The feeding of kapok meal was attempted, but it was found impossible to induce the sheep or some dairy cattle to consume a sufficient quantity of this product to permit a digestion trial.

Production and quality of meat from native and grade yearling cattle, E. H. Hostetler, J. E. Foster, and O. G. Hankins (*North Carolina Sta. Bul. 307 (1936), pp. 36, figs. 10*).—The studies herein reported were conducted for

the purpose of comparing the offspring of native cows and a native bull with the offspring of native cows and a purebred Hereford bull with respect to the rate and efficiency of gain during the growth and fattening periods and the quality of the meat produced as determined by laboratory, cooking, and palatability tests. The production phase of this study was carried out in the tidewater region of northeastern North Carolina. The experimental animals were wintered as calves on native roughage and cottonseed meal, grazed principally on reeds during the second summer, placed in the fattening pens about November 15 as long yearlings, and finished on a ration of locally grown corn, soybean hay, and cottonseed meal. The grade Hereford animals excelled the native stock in rate of growth at all stages of the trial and, while the former consumed somewhat more feed per head daily, the latter group actually required 13.5 percent more concentrates and 17.4 percent more soybean hay per 100 lb. of gain. On the basis of feed prices used, the cost of gain was $1.31 per hundredweight cheaper for the grade Herefords than for the native stock.

The various phases of the meat study were carried out in the laboratories of the U. S. Department of Agriculture. As feeder stock, slaughter animals, and dressed carcasses, the grade Herefords consistently graded higher than the native cattle, the 4-yr. average carcass grade being low good and medium, respectively. The grade cattle dressed 0.53 percent higher, were fatter, and produced a higher percentage of edible meat and a lower percentage of bone than the native cattle. In cooking tests rib roasts from the grade cattle showed more loss from drippings, less loss from evaporation, and more total cooking loss than like cuts from native cattle, the average difference being 0.5 percent. Both mechanical tests and palatability tests indicated that the meat from the grade animals was more tender than from the native cattle, but no other significant differences between the two lots were brought out in palatability studies.

The influence of castration on the growth and fattening in cattle, Y. Habu and M. Ishihara (*Imp. Zootech. Expt. Sta., Chiba, Japan, Bul. 32 (1935), pp. 22+14, pls. 14, fig. 1*).—In a study extending over a 480-day rearing and fattening period no significant differences were noted in the weight growth, growth in height at withers, or economy of feed utilization between lots of native Japanese male calves castrated at 6 mo. of age and at 1 yr. of age and normal bulls. The steers castrated at 6 mo. showed almost complete finish at the end of the experiment, whereas the other lots were not completed at that time. Both steer lots gave carcasses of similar marbling and smoothness of the subcutaneous fat layer, and both were markedly superior to the bull carcasses in this respect. Both lots of steers were considered desirable beef type, whereas the bulls developed secondary sex characteristics and were of less desirable type.

Grazing and parasitical studies with cattle and sheep, M. G. Snell (*Louisiana Sta. Bul. 279 (1936), pp. 38, figs. 6*).—This is a report of a series of grazing tests on permanent pastures established on rich alluvial soil designated as riverfront land. Five pasture areas were used according to the following plan of management and stocking: Lot 1, unimproved, grazed with cattle; lot 2, improved by disking and seeding, grazed with cattle; lot 3, unimproved, grazed with both cattle and sheep; lot 4, unimproved, grazed with sheep; and lot 5, improved as above and grazed with sheep. Five years' results for lots 1 and 2, and 3 years' results for lots 3, 4, and 5 are reported. The average per acre gains for the last 2 yr. of the trial, during which all areas were comparable, were: Lot 1, 225 lb.; lot 2, 335; lot 3, 340; lot 4, 12; and lot 5, 12 lb.; and the average marketable gains, that is, the gains made by calves and lambs,

were lot 1, calves, 151 lb.; lot 2, calves, 203; lot 3, calves and lambs, 219; lot 4, lambs, 12; and lot 5, lambs, 14 lb. These data indicate the marked increase in gains from improving pastures for cattle, the beneficial effect of grazing sheep and cattle together, and the futility of attempting to make economical gains from such pastures with sheep alone.

With regard to parasitic infestation, it is concluded that the plan of grazing cattle and sheep together was a more effective means of controlling intestinal parasites in lambs than biweekly drenching either with a 1-percent solution of bluestone or a solution containing 1 percent each of bluestone and nicotine sulfate at the rate of 1.2 cc per pound of live weight. Moreover, calves grazed in combination with sheep had fewer intestinal parasites than calves grazed in the regular cattle pasture.

The grazing system exerted a pronounced influence on the pasture flora, those grazed with cattle showing a preponderance of Bermuda grass, those grazed with both cattle and sheep showing a comparatively higher percentage of Dallis grass, and those grazed by sheep alone having a higher percentage of broomsedge, which the sheep refused to graze.

Technique of digestibility trials with sheep and its application to rabbits, S. J. Watson and E. A. Horton (*Empire Jour. Expt. Agr., 4 (1936), No. 13, pp. 25–35, pl. 1*).—This contribution from the Agricultural Research Station, Jealott's Hill, Berkshire, presents a detailed description of the technic employed in conducting digestion trials with sheep, including methods of calculating digestion coefficients and the starch and protein equivalents of different feeding stuffs. The question of correcting the coefficient of protein digestibility to account for the metabolic nitrogen in the feces is discussed and reasons are offered in favor of retaining the uncorrected values.

In comparative digestibility trials with sheep and rabbits it is shown that the latter invariably digest fiber much less efficiently than the former. In trials with grasses satisfactory agreement was obtained only in the case of protein digestion, indicating that the values obtained with rabbits cannot be applied to sheep. The desirability of a satisfactory indicator substance for simplified digestibility trials is discussed, although no satisfactory technic for such procedure has been developed by the authors to date.

Fat lamb production: Sheep crossing experiments conducted at Askham Bryan, York, 1930 to 1935, G. C. A. Robertson (*Univ. Leeds and Yorkshire Council Agr. Ed. [Pam.] 183 [1936], pp. 52, figs. 16*).—In a series of crossbreeding experiments with sheep for the production of market lambs, a satisfactory type lamb was produced by crossing Cheviot ewes with Ryeland, Shropshire, Southdown, or Suffolk rams. Practically all lambs in these lots were sufficiently fat to be marketed when weighing just over 70 lb. The Suffolk cross netted a substantially greater profit than Ryeland and Shropshire crosses, while the Southdowns were intermediate in this respect.

In a second series of experiments in which Masham ewes were crossed with Leicester, Oxford, and Suffolk rams it was found necessary to keep such lambs until they were approximately 10 lb. heavier than the former lots in order to fatten them properly for marketing. The Oxford and Suffolk crosses were about equal in net profit returned, both exceeding the Leicester cross.

The nutrition of the bacon pig.—I, The influence of high levels of protein intake on growth, conformation, and quality in the bacon pig, H. E. Woodman, R. E. Evans, E. H. Callow, and J. Wishart (*Jour. Agr. Sci. [England], 26 (1936), No. 4, pp. 546–619, pl. 1*).—In this extensive experiment three different levels of protein feeding have been employed, each level being tested with a lot of 10 carefully selected Large White bacon pigs fed individually

and with a similar lot of pigs fed by the group feeding plan. The high protein concentrates in the rations consisted of various combinations of white-fish meal, meat meal, and soybean oil meal. The ration fed lot 1 in each series contained 12 percent of protein-rich concentrate until the pigs had attained a live weight of 90 lb., 10 percent from 90 to 150 lb., and 5 percent from 150 lb. until slaughtered, while lot-2 rations contained 22, 20, and 15 percent, and lot-3 rations 32, 30, and 25 percent of protein concentrate during these three respective growth stages.

The lower level of protein proved adequate for normal growth in each series, no greater growth rate being attained at the intermediate protein level, while the highest level of protein feeding resulted in a slight depression in rate of growth and a slight increase in the amount of feed required per unit of gain. Slight differences in rate and economy of gain in favor of females over males were also noted. Of particular interest from the standpoint of experimental methods is the fact that the group feeding trials gave results generally supporting the individual feeding trial. However, owing to the relative insensitivity of the group feeding lay-out, it was not possible to show that the effects of different feeding treatments under this plan were statistically significant, whereas differences due to feeding conditions and to sex were statistically significant under the individual feeding plan.

From slaughter tests results are presented on the quality of the carcass, the thickness of back and belly fat, the percentages of fat and lean in various cuts, the composition of certain muscle tissue, the size of the kidneys, and the iodine value of the fat. In general, the different feeding methods had no significant influence on the quality and composition of the carcass. A lengthy discussion of numerous associated factors is presented.

Rations for weanling pigs, L. A. Weaver (*Missouri Sta. Bul. 376 (1937), pp. 8, fig. 1*).—This is a report of a series of experiments to determine the value of various protein concentrates as supplements to corn in the ration of weanling pigs. The results indicate that pigs fed a corn and tankage ration in dry lot made relatively very poor gains as compared with pigs receiving the same ration and pasture. A ration of corn supplemented with a mixture of liver meal, dried skim milk or buttermilk, and alfalfa meal plus minerals in dry lot proved superior to the corn-tankage ration with pasture, while the latter gave better results than rations of corn and skim milk or corn, tankage, oil meal byproducts, and alfalfa meal in dry lot. A mixture of equal parts of tankage, linseed oil meal, fish meal, liver meal, dried skim milk, and alfalfa meal proved a more efficient supplement to corn than a mixture of three parts tankage, one part linseed oil meal, and one part alfalfa, although the advantage of the former was largely confined to the first 28-day period following weaning. In a final experiment to determine whether the dried skim milk, fish meal, or liver meal was responsible for the advantage noted in previous experiments, any of the three or combinations gave beneficial results, the liver meal proving more efficient than dried skim milk, which in turn was superior to the fish meal.

The use of wood sugar in pig fattening, H. Bünger (*Die Verwendung von Holzzucker in der Schweinemast. Berlin: Paul Parey, 1936, pp. [3]+226, figs. 6; also in Landw. Vers. Sta., 126 (1936), No. 1-6, pp. 1-226, figs. 6*).—This publication describes the manufacture of wood sugar under commercial conditions. The wood is treated with concentrated hydrochloric acid, the acid removed by distillation, and the sugar solution concentrated. About 67 kg of carbohydrates are obtained per 100 kg of wood. The hydrochloric acid is recovered along with acetic acid and other valuable byproducts. Normally the sugar sirup is neutralized with lime and fed by mixing with other dry feeding

stuffs. The product has a starch equivalent value of 62.1 kg per 100 kg of dry sugar, ranking it as about equal to cane sugar in nutritive value. Two parts of sugar can be mixed with one part of such feeds as crushed barley or dried potato flakes and stored for several months without deterioration and with little change.

In a series of feeding trials with pigs the starch value of a sugar-potato mixture was equal to that of potatoes alone, and a sugar-barley mixture was only slightly inferior to barley alone. Wood sugar (and wood sugar yeast as a source of protein) are considered potentially important feeding stuffs.

Feeding wood sugar yeast as a source of protein to working horses and the replacement of oats by dried beet slices or potato flakes and wood sugar yeast [trans. title], P. Ehrenberg and H. Nietsch (*Landw. Vers. Sta., 125 (1936), No. 5–6, pp. 301–339*).—Wood sugar yeast, along with dried beet slices or potato flakes as a part of the usual feed for working horses, proved to be a satisfactory substitute for oats in the ration. The wood sugar yeast was unpalatable at first, but this was overcome by adding a small amount of molasses which was later omitted. The crude protein of the yeast had a digestibility of 94.3 percent (82.6 percent for pure protein). The yeast as delivered contained 41.4 percent digestible crude protein (33.3 percent digestible pure protein) and 89.6 percent dry matter.

The usefulness of winter and summer-fall egg yield records as criteria of poultry breeder selection, W. C. Thompson and F. P. Jeffrey (*New Jersey Stas. Bul. 612 (1936), pp. 26, figs. 10*).—In conducting this study, the first year egg yield records of 2,028 purebred Single Comb White Leghorn pullets, entered in New Jersey egg-laying contests during a typical year of operation, have been employed. The record year has been divided into three parts, namely, the winter season (October 1 to January 31), the spring season (February 1 to May 31), and the summer-fall season (June 1 to September 22). In comparing the winter egg production and the summer-fall egg production with annual egg yields it is shown that each of these seasonal yields bears a highly significant positive correlation to the annual yield, each being of curvilinear character and expressed by the regression equation $Y=136.24 \log X-30.79$ and $Y=133.22 \log X-31.62$, respectively, in which Y represents the annual and X the seasonal production. However, an insignificant degree of correlation was found to exist between winter yields and summer-fall yields, indicating that fowls inherit precosity or winter production tendency entirely separately from the factor of persistency or summer egg yield tendency. A combination of the winter and summer-fall records also bears a highly significant positive correlation to annual yield. This is a curvilinear relationship expressed by the regression equation $\log Y=0.8367 \log X+0.5653$. A remarkably close correlation was found to exist between the observed yield and computed annual yield by this method. It is concluded that trap-nest records for either the winter period or the summer-fall period may be employed with confidence in the selection of breeding stock and that the combined winter and summer-fall records are highly valuable in this respect, being possibly of somewhat greater accuracy for that purpose than the record of exact egg production performance over the full year.

Selecting poultry breeders by means of winter and summer-fall egg yield results, W. C. Thompson and F. P. Jeffrey (*New Jersey Stas. Hints to Poultrymen, 24 (1936), No. 1, pp.* [*4*]).—This is a popular summary of the above.

Measurements of quantity and quality of egg yield, W. C. THOMPSON, D. PHILPOTT, and H. C. PAGE (*New Jersey Stas. Bul. 614 (1936), pp. 31, figs. 5*).—This is a revision of Bulletin 528 (E. S. R., 66, p. 364) and presents essentially the same conclusions as those previously noted.

The constancy of the albumen index of eggs from individual hens, L. A. WILHELM and V. HEIMAN (*U. S. Egg and Poultry Mag., 42 (1936), No. 12, pp. 750, 751, 761*).—Employing the method for determining the albumin index of eggs previously noted (E. S. R., 76, p. 234), the Washington Experiment Station has studied the constancy of the albumin index for individual hens. In one group all eggs produced during a 30-day period were used, and in a second group all eggs laid during a 14-day period plus eggs collected at intervals during the succeeding weeks were included. For the periods of time and uniform environmental conditions prevailing during this study, hens have the individual characteristic of producing eggs which have a relatively constant albumin index.

Formation of the chalazae in the hen's egg, H. J. ALMQUIST (*Poultry Sci., 15 (1936), No. 6, pp. 460, 461*).—In this study at the California Experiment Station the author has noted that, in 520 White Leghorn eggs in which both chalazas were normal, the chalaza at the large end of the egg invariably had a clockwise twist and the one at the small end a counterclockwise twist. As an explanation of this condition it is postulated that the egg is invariably located in the uterus small end caudad, that the egg as a whole rotates in a counterclockwise direction, and that the yolk rotates less frequently than its envelopes, thus causing the opposite twists in the mucin strands which comprise the chalaza. This condition, together with the syneresis in the firm albumin, results in these strands shrinking together into a twisted cordlike structure.

The association of certain measures of interior egg quality with hatchability, G. O. HALL and A. VAN WAGENEN (*Poultry Sci., 15 (1936), No. 6, pp. 501–506, fig, 1*).—The [New York] Cornell Experiment Station has made correlation studies to determine the relation of hatchability of eggs to four measures of interior egg quality, namely, condition of firm albumin, percentage of firm albumin, percentage of outer thin albumin, and yolk index. The condition of firm albumin was found to be the only one of these factors significantly correlated with hatchability. Eggs showing a defective condition of the firm albumin suffered greater embryonic mortality, particularly during the second to the seventh day of incubation, than eggs which were satisfactory in this respect. Although it has not been demonstrated that the condition of firm albumin is a governing factor in hatchability, it appears that because of the existing relationship selection for high hatchability should tend to improve egg quality.

A hatchability study among Ohio hatcheries, G. S. VICKERS (*Poultry Sci., 15 (1936), No. 6, pp. 496–500*).—In a summary of the 1935 reports from Ohio hatcheries, it is shown that sudden cold spells during the winter invariably cause a drop in hatchability of eggs, starting from 3 to 4 days after the onset of the cold spell and continuing for several days. A rather marked and constant difference in hatchability results was noted between hatcheries in the northern and southern parts of the State in favor of the latter group. These differences were greatest in the late winter and were of small consequence after April 21. The season's average for the highest percentage of hachability noted each week was 76 and for the lowest 55.4, with the highest occurring in a hatchery in the southern part of the State in most cases.

Rearing chicks from the incubator to the laying pen or fattening crate, F. C. ELFORD and H. S. GUTTERIDGE (*Canada Dept. Agr. Pub. 531 (1936), pp. 8, fig. 1*).—A popular circular discussing methods in brooding and rearing, types

of poultry for market, finishing poultry for marketing, killing and plucking, and selecting the layers.

The distribution and properties of the anti-gizzard-erosion factor required by chicks, H. R. Bird, O. L. Kline, C. A. Elvehjem, E. B. Hart, and J. G. Halpin (*Jour. Nutr., 12 (1936), No. 6, pp. 571–582*).—In this investigation at the Wisconsin Experiment Station the results indicate that the dietary factor preventing gizzard erosion in chicks is distinct from the antihemorrhagic factor, confirming the findings of Almquist and Stokstad (E. S. R., 76, p. 88). At variance with these findings, however, the authors have found alfalfa and other leafy plant tissue to be generally unsatisfactory as a source of the anti-gizzard-erosion factor and also that this factor is insoluble in fat solvents. Pork lung, liver, and kidney tissue were found to contain an abundance of the factor, which followed the alkali-soluble, acid-precipitable proteins during fractionation. However, this method of fractionation was unsuccessful when applied to oats, indicating that the factor is not necessarily a part of a protein molecule. Cereals were ranked oats, wheat, and corn in order of the abundance of this factor. The possibility of identity of this factor with certain members of the B complex is briefly discussed.

The state and partition of the calcium and inorganic phosphorus in the serum of the fowl: Effect of growth and ovulation, D. M. Greenberg, C. E. Larson, P. B. Pearson, and B. R. Burmester (*Poultry Sci., 15 (1936), No. 6, pp. 483–489, fig. 1*).—The authors have made a comparative study of the partition of calcium and inorganic phosphorus in the blood serum of ½- to 5½-month-old growing chicks and of prelaying and laying hens from 6 to 8 mo. of age. In the growing chicks the total serum calcium remained relatively constant (from 11.3 to 12.9 mg per 100 cc) throughout the period, whereas the total serum inorganic phosphorus progressively decreased (from 10 to 5.5 mg per 100 cc) with increasing age. During the immediate prelaying and laying periods a very marked increase in serum calcium was noted, accompanied by a relatively small increase in the inorganic phosphorus level. The calcium increase was confined almost exclusively to the nondiffusible fraction, with experimental evidence that the calcium-combining capacity of the serum vitellin is sufficiently great to account for the excess nondiffusible calcium.

Some reasons for early sexual maturity including "stagginess" of cockerels—its possible control discussed, N. F. Waters (*U. S. Egg and Poultry Mag., 42 (1936), No. 11, pp. 664–668, figs. 6*).—This contribution from the Iowa Experiment Station presents data on the growth rates and time of sexual maturity of light and heavy breeds of chickens and for the first and second generations of cross-bred strains. On the average sexual maturity is reached when the bird has attained approximately 90 percent of its mature body weight. Breeding and selecting for early maturing strains result in reducing the average mature size of the stock. Apparently a bird is early maturing sexually because it is small and not a small bird because it is early sexually maturing. The need for a constructive research program in poultry breeding with reference to the quality of market poultry is stressed.

Preliminary studies of a cerebral disorder of young chickens, J. P. Delaplane, H. O. Stuart, and C. P. Hart (*Science, 84 (1936), No. 2183, pp. 396, 397*).—This report from the Rhode Island Experiment Station notes the occurrence of a brain disorder in young chicks in the field under a wide variation of feeding and management practices, breeds, and strains. The faster-growing chicks from 3 to 6 weeks of age seem most susceptible. This disorder shows a close resemblance to that described by Pappenheimer and Goettsch.[1] Cultural tests indi-

[1] Jour. Expt. Med., 53 (1931), No. 1, pp. 11–26, pls. 3, figs. 2.

cate that it is not of an infectious nature and is probably of a nutritional type. In controlled experiments with a number of rations only one group on a ration in which corn was the main ingredient developed the typical symptoms and brain lesions. It is believed that some factor or factors in the corn were responsible for or at least contributed to this disorder.

A field condition resembling nutritional encephalomalacia in chicks, E. JUNGHERR (*Science, 84 (1936), No. 2190, pp. 559, 560*).—This contribution from the [Connecticut] Storrs Experiment Station notes the occurrence of a brain disorder in brooder chicks, fed on a number of commercial and home-mixed rations, which is indistinguishable from nutritional encephalomalacia inducible on simplified diets as described by Pappenheimer and Goettsch, and noted above. Comparatively large fast-growing chicks from 14 to 59 days of age are most susceptible. Symptoms of the disorder are discussed. Histological examination of certain organs was necessary to distinguish this field encephalomalacia from other nonmicrobial paralytic disorders in growing chicks.

Chicken vices, D. C. KENNARD (*Ohio Sta. Bimo. Bul. 184 (1937), pp. 33–39, figs. 2*).—The most common causes of feather picking and cannibalism are discussed, and effective prevention and control methods are suggested. Debeaking, i. e., removing the tip of the upper beak, has proved the most satisfactory control procedure. The method whereby the beak tip is removed with comparatively little discomfort to the bird and practically no loss of blood is described.

A study of egg production in Bronze turkeys, S. J. MARSDEN (*Poultry Sci., 15 (1936), No. 6, pp. 439–445*).—This study, conducted at the U. S. D. A. Range Livestock Experiment Station at Miles City, Mont., was undertaken to obtain information on the egg-laying habits and ability of turkeys. Single egg clutches constituted 37.65 percent and 42.19 percent of all clutches recorded for young hens and older hens, respectively. The average size of all clutches averaged 2.39 eggs and 2.23 eggs for these respective groups. The largest clutch recorded was 19 eggs laid by a young hen. It seems evident that turkeys, when fed and managed for maximum egg production, do not differ significantly from chickens in their laying habits.

Young hens in their first laying season produced an average of 39.9 eggs to May 31 without artificial lighting and 48.9 eggs with artificial lighting starting in February. Hens in their second laying season without artificial lights averaged 27.6 eggs from the beginning of the laying season to May 31, while hens in their third, fourth, and fifth laying seasons with artificial lights in each instance averaged 29.1, 23.7, and 14 eggs, respectively, over a like period. Annual egg production for a flock without artificial lighting averaged 55.8 eggs in 1930 and 59.7 in 1931.

Egg size in relation to growth of Narragansett turkeys, H. M. SCOTT and R. E. PHILLIPS (*Poultry Sci., 15 (1936), No. 6, pp. 435–438*).—In this study at the Kansas Experiment Station 538 eggs ranging from 67.6 to 100.5 g in weight and representing approximately a normal frequency distribution were used for hatching. Correlating weight of turkeys at 24 weeks of age with egg weight showed a coefficient of correlation of 0.179 ± 0.046 for males and 0.119 ± 0.046 for females. It seems evident that egg weight in no way conditions the mature weight of turkeys, although a high correlation was noted between egg weight and day-old weight of poults.

The protein requirement of Ringnecked pheasant chicks, L. C. NORRIS, L. J. ELMORE, R. C. RINGROSE, and G. BUMP (*Poultry Sci., 15 (1936), No. 6, pp. 454–459, fig. 1*).—In a series of feeding tests with ring-necked pheasant chicks, the protein content of otherwise adequate rations was varied from 15 to 33 percent. Maximum growth during the first 8 weeks of life was obtained by

feeding a 30 percent protein ration, and excellent growth was obtained from rations containing 21, 24, and 27 percent protein. A 24 percent ration is suggested as one which will give generally satisfactory results without danger of creating partial deficiencies of other essential nutritive elements.

Some elementary concepts in the theory of sampling, W. A. HENDRICKS (*Poultry Sci., 51 (1936), No. 6, pp. 462–465*).—This contribution from the U. S. D. A. Bureau of Animal Industry discusses some concepts involved in the theory of sampling, with special reference to poultry experiments, and directs attention to the interpretation to be placed on some of the newer developments in the application of statistical technic to agricultural experiments.

DAIRY FARMING—DAIRYING

Dairying in Arizona, W. S. CUNNINGHAM (*Arizona Sta. Bul. 155 (1937), pp. 27–67, figs. 18*).—This deals with the characteristics of the various breeds of dairy cattle, the selection of individual animals, the composition and characteristics of feeds, feeding various classes of dairy animals, balancing rations, and general rules for feeding. Results of feeding experiments comparing hairy Peruvian v. common alfalfa hay and bud-stage v. one-third bloom alfalfa hay for milk production are also presented. No significant differences were found regarding the feeding value of the two varieties tested. A slight difference in favor of the bud-stage hay is reported.

[Investigations with dairy cattle in Florida], R. B. BECKER, W. M. NEAL, A. L. SHEALY, and P. T. D. ARNOLD (*Florida Sta. Rpt. 1936, pp. 49, 50, 51, 53, 54*).—Data obtained in studies with dairy cattle are reported on mineral deficiencies in feeds used in cattle rations, the ensilability of sugarcane and other Florida forage crops, the feeding value of crotalarias, and the digestible coefficients and feeding value of dried grapefruit refuse and dried orange refuse.

[Investigations with dairy cattle and dairy products in Oklahoma] (*Oklahoma Sta. [Bien.] Rpt. 1935–36, pp. 5–25, 70, 71, 73–75*).—Work was continued on most of the research projects previously noted (E. S. R., 73, p. 93), and brief results are presented on "cottonseed meal injury" an incorrect term, by A. H. Kuhlman, E. Weaver, and W. D. Gallup; the comparative value of good prairie hay and alfalfa hay in the dairy ration, by Kuhlman, Weaver, and A. Nalbandov; the digestibility and feeding value of mung bean silage, by Kuhlman, Weaver, Gallup, and Nalbandov; two types of blindness in cattle which are related to vitamin A deficiency, by Kuhlman, Weaver, and Gallup; influence of purebred sires in improving a scrub dairy herd, by P. C. McGilliard and Weaver; effects of cottonseed meal on dairy products, by J. I. Keith, Kuhlman, Weaver, and Gallup; factors involved in the development of oxidized and rancid flavors in milk, by Weaver, E. L. Fouts, Keith, and McGilliard; ionic equilibriums in ice cream mixes and the manufacture of cream and Neufchatel cheese, both by Keith, Fouts, and Weaver; and a test for sediment in cream, by Fouts.

[Experiments with dairy cattle and dairy products in Pennsylvania] (*Pennsylvania Sta. Bul. 336 (1936), pp. 12, 28–30*).—Reports of dairy cattle investigations include the value of bonemeal in the ration of milking cows, by S. I. Bechdel; the deficiency of carotene in dairy calf rations containing large amounts of cottonseed meal, by Bechdel and S. R. Skaggs; and the effect of feeding poor quality hay to calves, by Bechdel and R. E. Ward.

In studies with dairy products results are reported on tallowy flavor in milk, by C. D. Dahle; a comparison of glass and paper bottles as containers for milk and dairy products, and standardization of the equipment and procedure for determining curd tension of milk, both by F. J. Doan; the relation

of the fat globule membrane to the whipping ability of ice cream mixes, by Dahle and D. V. Josephson; and vitamins in milk as related to fat content, breed characteristics, and stage of lactation, by N. B. Guerrant.

[Dairy cattle investigations in South Carolina] (*South Carolina Sta. Rpt. 1936, pp. 50, 54–60, fig. 1*).—Results are reported on the response of the individual cow to the milking machine, and various kinds of silage as the only roughage for milking cows, both by E. C. Elting and J. P. LaMaster; and factors affecting the carotene content of feeds grown in South Carolina, by J. H. Mitchell and LaMaster.

[Experiments with dairy cattle and dairy products], T. M. Olson (*South Dakota Sta. Rpt. 1936, pp. 20, 21–25*).—Results obtained in tests with dairy cattle are reported on the effect of lack of direct sunlight on production and reproduction of dairy cows; a comparison of sweetclover, alfalfa, and Sudan grass pasture under South Dakota conditions; permanent pasture mixtures; variations in calcium and phosphorus content of cows' milk during the lactation period; the relation of vitamin D to the calcium and phosphorus retention of mature lactating cows as shown by balance trials; and a breed comparison in ability to transform and convert the vitamin D of the feed ingested to the milk produced.

Studies with dairy products yielded results on the effect of tankage on the flavor of milk; the relation of the amino nitrogen content to quality of cream and butter; variation in Ca and P content of milk during lactation; the relationship between the lipolytic and proteolytic micro-organisms in butter and the development of specific flavor defects in butter; and the influence of roughage on the vitamin D potency of milk.

[Dairy cattle investigations in Wyoming] (*Wyoming Sta. Rpt. 1936, pp. 8, 18*).—Results are briefly noted on roughage for dairy heifers, the quality of pasture and hay for dairy cows, and comparative milk yields with and without grain on alfalfa hay and irrigated pasture and with alfalfa hay v. native hay.

[Dairy cattle investigations at the Wyoming State experiment farms] (*Wyoming Sta. Bul. 219 (1937), pp. 4, 5, fig. 1*).—Studies at the Afton Substation yielded results on the comparative value of native meadow hay and alfalfa hay for milking cows, the increased milk yield resulting from adding ground barley to a ration of alfalfa hay and pasture, and open sheds v. modern barn stanchions for milking cows.

Milk yield dependent on ration (*Utah Sta. Bul. 276 (1936), p. 11*).—Studies by G. Q. Bateman and G. B. Caine are noted comparing rations of alfalfa hay and pasture and alfalfa hay, corn silage, and pasture for milking cows with an alfalfa hay, ground barley, and pasture ration.

Legume silage for dairy cows, C. C. Hayden, A. E. Perkins, W. E. Krauss, C. F. Monroe, and R. G. Washburn (*Ohio Sta. Bimo. Bul. 184 (1937), pp. 21–27, fig. 1*).—This report discusses the possibility of ensiling untreated legumes, molasses-treated legumes, and legumes treated with mineral acid (A. I. V. process). Data are presented indicating that the feeding of the acid-treated silage supplemented with ground limestone results in a marked increase of urinary ammonia and a decrease of bicarbonates in the urine, although not to a dangerous extent. This feed proved superior to alfalfa hay in stimulating milk production and in maintaining a desirable carotene concentration in the butterfat during the winter feeding period. The carotene content of the legume plant was preserved nearly intact by this method.

Apparently a legume silage of good feeding value may be prepared by any of the three systems discussed, but only the treatment with acid offers a reliable way of preserving a high percentage of the carotene content of the crop.

The nutritive value of raw and pasteurized milk for calves: The assimilation and retention of nitrogen, phosphorus, and calcium, J. H. Blackwood, S. Morris, and N. C. Wright (*Jour. Dairy Res. [London], 7 (1936), No. 3, pp. 228–237, fig. 1*).—This experiment involved a total of 16 Ayrshire male calves placed on experiment at 10 days of age and fed either raw or pasteurized milk at the rate of 10 percent of their body weight daily. Three series of trials are reported, in the first and third of which calves were fed by the double reversal method over three 24-day experimental periods, while in the second trial the calves were fed on the same diet continuously over a 42-day test period.

As measured by the rate of assimilation and retention of nitrogen, calcium, and phosphorus, no significant differences were found between the two types of milk. It appears that milk is relatively deficient in calcium and to a less extent in phosphorus when used as the sole diet for calves. The including of pasture grass or hay in the ration materially improves the nitrogen: calcium balance. No pathological conditions were encountered.

Nutritional anemia, calcium, phosphorus, and nitrogen balance and bone composition of rats fed raw versus pasteurized milk, H. A. Lasby and L. S. Palmer (*Jour. Dairy Sci., 18 (1935), No. 3, Sup., pp. 6*).—This supplement presents an authors' correction of the original article (E. S. R., 73, p. 377). Accordingly the last paragraph of the abstract should be changed to read:

Calcium and nitrogen retentions were slightly though not significantly greater on the raw milk. Phosphorus retentions were the same on the two diets. The bones of rats fed raw milk had a higher percentage of ash than those of rats fed pasteurized milk, the difference being statistically but not biologically significant and not explained on the basis of the better growth of the rats receiving the pasteurized milk. The mean calcium and phosphorus contents of the bones of rats on raw milk were slightly but not significantly higher than those on pasteurized milk. The mean calcium and phosphorus contents of the milk were the same before and after pasteurization.

Dairy goats in Missouri, C. W. Turner, A. C. Ragsdale, and E. R. Garrison (*Missouri Sta. Bul. 375 (1937), pp. 23, figs. 11*).—This bulletin consists of a series of questions and answers dealing with the characteristics of the various breeds of dairy goats, breeding, feeding, and management problems concerning the goat herd, and the composition and production of quality milk.

[Proceedings of the ninth annual State College of Washington Institute of Dairying] (*Wash. State Col., Inst. Dairying Proc., 9 (1936), pp. [3]+144, figs. 9*).—The following papers were presented at the meeting held at Pullman, March 2–7, 1936 (E. S. R., 74, p. 90): New Research on the Utilization of Dairy By-products for Poultry Feeding, by V. Heiman (pp. 3, 4); Problems of the Cheese Industry, by L. A. Rogers (pp. 4–12); Trends in Butter Manufacture—Meeting the Consumer's Demand, by M. Mortensen (pp. 12–17); Some Factors Affecting Butter Consumption, by N. S. Golding (pp. 17–23); Hedging Practice—Price—Price Insurance, by H. E. Van Norman (pp. 23–26); Standardization of Butter and the Value of Graphic Chart, by M. Mortensen (pp. 26–35); Physical Defects of Retail Cream, by N. S. Golding (pp. 36–46); The Dairy By-products Problem, by L. A. Rogers (pp. 47–53); Uses of Dairy Products by the Baker, by C. A. McDuffee (pp. 53–57); Practical Pointers on Plant Mechanics, by R. Monahan (pp. 57–59); Three Years of Educational Butter Scoring Work at the State College of Washington, by H. A. Bendixen (pp. 60–68); What Economic System Does Business Want? by R. B. Heflebower (pp. 69–71); The Function of the Laboratory in the Dairy Industry, by L. A. Rogers (pp. 71–79); Plant Engineering Problems in the Manufacture of

Dairy Products, by B. O. Opitz (pp. 79–85); Sodium Alginate Products in Ice Cream and Chocolate Milk, by S. E. Briggs (pp. 85–90); Recent Research Developments in Ice Cream Manufacturing, by D. R. Theophilus (pp. 91–96); Dairy Research of the State College of Washington, by E. V. Ellington (pp. 96–99); Refrigeration of Milk Delivery Units, by M. Matthews, Jr. (pp. 100–108); New Developments in Milk Plant Equipment, by E. N. Muzzy (pp. 108–116); Milk and Citrus Juices, by D. S. Courtney (pp. 117–120); Problems of the Fluid Milk Industry, by L. A. Rogers (pp. 120–129); Artificial Insemination in Dairy Cattle, by T. C. Webster (pp. 129–131); The Herd Test, by E. W. Van Tassell (pp. 131–133); and The Color, Carotene, and Vitamin A Content of Milk as Influenced by the Feed, by R. E. Hodgson (pp. 133–136).

Judging quality in dairy products, P. A. Downs (*Nebraska Sta. Circ. 54 (1937), pp. 44, figs. 11*).—This circular presents score cards, outlines methods of procedure, and discusses terms applicable to common defects, for the judging of milk, cream, butter, Cheddar cheese, and ice cream. Suggestions for conducting a dairy products judging contest are offered.

The comparative values of the plate count and the modified methylene-blue reduction test as routine methods for grading milk, A. A. Nichols and S. J. Edwards (*Jour. Dairy Res. [London], 7 (1936), No. 3, pp. 258–270, fig. 1*).—Based on experimental results as reported, the authors conclude that the results obtained by the modified methylene blue reduction test (1) show reasonable agreement with, and are less variable than, those obtained by the plate count, (2) show as good an agreement with other measures of cleanliness as does the plate count, and (3) are not invalidated by the presence of abnormal milk. Consequently they regard the methylene blue reduction test as having outstanding advantages for the general purpose of classifying milk according to bacterial quality.

Van Oijen modification of the Frost Little plate method: A critical investigation of Van Oijen's test for the bacterial content of milk samples, H. Barkworth (*Jour. Dairy Res. [London], 7 (1936), No. 3, pp. 244–257*).—This report is based on a statistical examination of the results obtained on the bacterial content of 31 low-count milk samples (3,000 to 30,000 per cubic centimeter) and 31 high-count milk samples (30,000 to 300,000 per cubic centimeter), each tested in quintuplicate by both the Van Oijen and the standard plate count methods, employing standardized technic as outlined. The former test is shown to be significantly more accurate than the latter, although the average count by the Van Oijen method is 1 to 3 percent log lower than the average plate count. The effect of the size of samples on reproducibility of results is discussed.

A critical study of some of the growth-promoting and growth-inhibiting substances present in brilliant-green bile medium, C. N. Stark and L. R. Curtis (*Jour. Bact., 32 (1936), No. 4, pp. 375–384*).—In this report from the [New York] Cornell Experiment Station 0.00133 percent of brilliant green in a 1-percent peptone 1-percent lactose medium completely inhibited growth of all members of the *Escherichia-Aerobacter* group. The addition of 2-percent dried oxgall to this medium materially reduced the toxicity of the brilliant green, permitting the growth of certain cultures which could be responsible for false tests by means of "synergism". Additional protein in the form of 1 cc of sterile milk to 14 cc of the medium permitted growth of even larger numbers of the above cultures and also resulted in growth of some sporulating false test organisms. These findings are regarded as having special significance in the use of brilliant green bile medium to test milk for the presence of the *Escherichia-Aerobacter* group.

Increased growth and gas production by Escherichia-Aerobacter organisms in brilliant green bile medium containing sodium formate, C. N. Stark and L. R. Curtis (*Jour. Bact., 32 (1936), No. 4, pp. 385–391*).—Continuing the above line of investigation, the addition of 0.5 percent of sodium formate to the brilliant green bile medium resulted in larger numbers and increased growth rate of *Escherichia-Aerobacter* organisms. It caused an earlier production of gas, and the formation of from two to three times as much gas, while failing to influence materially the growth of organisms which may be responsible for false tests.

Hemolytic streptococci in market milk, J. E. Simmons (*Jour. Bact., 32 (1936), No. 4, pp. 469, 470*).—This note from the Oregon Experiment Station reports the isolation of 101 cultures, showing definite evidence of hemolysis, from samples of market milk. Forty-one of these proved to be long chain streptococci, the characteristics of which are described. Most of the organisms could be placed in two large groups having the general characteristics of *Streptococcus mastitidis* and *S. infrequens*.

The vitamin and nitrogen requirements of the lactic acid bacteria, S. Orla-Jensen, N. C. Otte, and A. Snog-Kjaer (*K. Danske Vidensk. Selsk. Skr., Naturv. og Math. Afd., 9. ser., 6 (1936), No. 5, pp. 52; also in Zentbl. Bakt.* [etc.], *2 Abt., 94 (1936), No. 19–23, pp. 434–477*).—With regard to the vitamin requirements of lactic acid bacteria, it is shown that by treating skim milk with activated charcoal certain substances are adsorbed which render the milk unsuitable as a medium for these organisms. To reactivate the milk into a suitable medium it is necessary to add lactoflavine and also a thermostable alkalifast substance which appears to be identical with pantothenic acid, the main constituent of bios. It is further shown that not only true lactic acid bacteria of milk but all other lactic acid bacteria have a definite requirement for bios and lactoflavine, while other forms, e. g. the coli and aerogenes bacteria, thrive as well in charcoal-treated milk as in the untreated.

Peptones used in bacterial media contain sufficient lactoflavine for lactic acid bacteria but are too low in bios for a normal development of lactic acid rods, although generally sufficient for the streptococci. The proteolytic enzymes in addition to supplying lactoflavine and bios apparently contain other activators favorably influencing the lactic acid rods.

It is also shown that lactic acid bacteria have a high requirement as regards their nitrogen food, and in some cases this appears to be even more specific than in the case of higher animals. Even the streptococci which grow with ammonium salts as their only source of nitrogen respond favorably to additions of histidine, leucine, creatine, and nucleic acid.

A pigment-producing organism (Pseudomonas sp.) isolated from discoloured butter, E. R. Hiscox (*Jour. Dairy Res.* [*London*], *7 (1936), No. 3, pp. 238–243*).—This report describes an organism isolated from discolored areas in butter which was capable of reproducing the color in artificial cultures. A brown color produced by the organism diffused through the medium, while a blue-black insoluble pigment, produced only at low temperatures, was concentrated in and around the bacterial cells. Other cultural characteristics are described. The organism is regarded as a species of *Pseudomonas*, but its identity is not fully established and no specific name is assigned.

Milk production and control, W. C. Harvey and H. Hill (*London: H. K. Lewis & Co., 1936, pp. VIII+555, pls. 2, figs. 180*).—A treatise on the problem of the fluid milk supply in England. Successive chapters deal with composition and food value of milk, milk and disease, the cow, the cow shed, the dairy,

clean milk production, distribution, designated milks, the treatment of milk by heat, laboratory and other control, legislation, and the future of the milk industry.

The effect of ingested cottonseed meal upon the distribution of the constituent fatty acids of goat milk, R. W. RIEMENSCHNEIDER and N. R. ELLIS (*Jour. Biol. Chem., 114 (1936), No. 2, pp. 441–447*).—It is reported from the U. S. D. A. Bureau of Animal Industry that after cottonseed meal feeding the butterfat constants of goat milk fat indicate a decrease in butyric and unsaturated acids and an increase in acids concerned in the Polenske values.

A study of the fatty acid distribution by the methyl ester distillation method substantiated the general information obtained from the butterfat constants, and indicated, specifically, an increase in capric, lauric, myristic, and stearic acids at the expense chiefly of palmitic and oleic acids as a result of the inclusion of cottonseed meal in the ration. No evidence of the presence of linoleic acid was observed, although acids of the arachidonic type were found.

Vitamin C in pasteurized milk, P. F. SHARP (*Science, 84 (1936), No. 2186, pp. 461, 462*).—This report from the [New York] Cornell Experiment Station discusses various factors affecting the vitamin C content of milk. Pasteurization at 63° C. for 30 min. only slightly weakened the enzyme causing oxidation of ascorbic acid, whereas heating to 77° even momentarily almost wholly destroys it. It is shown that milk which does not come in contact with copper or copper-bearing alloys at any stage of the handling process may be pasteurized by the holder method and still maintain essentially the same ascorbic acid content as raw milk of the same age, and flash pasteurization at 77° results in greater ascorbic acid potency than raw milk of the same age. The presence of 0.13 p. p. m. of copper in milk caused a marked decrease of ascorbic acid content under the former method of pasteurization, but has little effect when milk is pasteurized at the higher temperature.

New developments in the field of vitamin D milk, W. E. KRAUSS and R. M. BETHKE (*Ohio Sta. Bimo. Bul. 184 (1937), pp. 3–12*).—This article discusses the various methods available for increasing the vitamin D content of milk, with an indication of the additional cost involved per unit of milk fortified and the vitamin D content practically attainable by the different methods. The problems involved in adequate control of fortified milks, the clinical evidence of the value of vitamin D enrichment, the possibility of fortification of other dairy products, and the future outlook for vitamin D milk are each treated briefly.

Testing cream and milk for butterfat, J. D. FOSTER (*Kentucky Sta. Regulat. Ser. Bul. 9 (1936), pp. 28, figs. 3*).—This presents a detailed description of the standard methods for conducting the Babcock test in testing cream and milk for butterfat and sets forth the provisions of the Kentucky Creamery and Testers License Law.

Discoloration and corrosion in canned cream, C. J. JACKSON, G. R. HOWAT, and T. P. HOAR (*Jour. Dairy Res. [London], 7 (1936), No. 3, pp. 284–290, pl. 1*).—From a study of certain defects observed in samples of canned cream after several months' storage it is shown that the most common defect, designated as "purpling" of the can, is produced by excessive time and temperature of sterilization due to the liberation of active sulfur compounds which attack the tin. The addition of sodium bicarbonate as a stabilizer up to 5 g per gallon of cream exerts a slight beneficial effect.

A more serious defect observed was pitting of the can, associated with the formation of black patches causing discolored cream and black specks in the body of the cream. These black patches consist of ferrous sulfide, stannous

oxide, or both, and under experimental conditions they were observed only in cans in which the steel was deliberately exposed.

Factors influencing the loss of butterfat in churning, J. Lyons and M. O'Shea (*Roy. Dublin Soc. Econ. Proc., 3 (1936), No. 1, pp. 1–18, figs. 4*).—A high proportion of small fat globules in the cream, employing relatively high churning temperatures, churning cream very high or very low in butterfat content, underloading the churn, and the use of small diameter churns, all contribute to loss of butterfat during the churning process. The lower the temperature to which cream is chilled after pasteurization the lower the churning temperature, and the more completely the churn is loaded (up to rated capacity) the less is the loss in butterfat during churning but the greater is the time required for churning.

A study of the body and texture of butter, S. T. Coulter and W. B. Combs (*Minnesota Sta. Tech. Bul. 115 (1936), pp. 39, figs. 13*).—This bulletin presents the results of a long-time study dealing particularly with that type of butter commonly graded as crumbly by Federal butter graders. The methods employed in the taking of trier samples and the apparatus employed in determining hardness, resistance to slicing, standing-up properties, and spreading qualities of butter are described. This defect, most commonly observed in winter butter, was found to be associated with, although not directly dependent upon, the composition of the butterfat. It is more correctly described by the terms "sticky" or "sticky-crumbly." In taking samples for judging a low temperature of both the trier and the butter tends to emphasize this defect, and the condition becomes increasingly less apparent as the temperature of either the trier or the butter, or both, is raised. The rapid cooling of cream, cooling to a very low temperature, churning at a low temperature, and the use of relatively warm wash water are concluded to be the main factors causing increased hardness of butter. The general quality of winter butter may be improved by avoiding excessive cooling of cream, churning at a temperature not lower than necessary to secure exhaustive churning, and washing the butter with water at from 40° to 50° F.

The influence of physical and mechanical treatment on the firmness of butter, J. Lyons (*Roy. Dublin Soc. Econ. Proc., 2 (1935), No. 34, pp. 541–558, figs. 2*).—The temperature at which cream is pasteurized by the flash method has little or no influence on the firmness of butter, but immediate cooling after pasterization and holding at low temperatures for from 2 to 3 hr. markedly increases the firmness of butter over that from cream which is not so cooled, and the lower the holding temperature the firmer is the butter. Increasing the holding time to 16 hr. or more is no more effective than from 2 to 3 hr. When cream has been properly cooled and held at low temperature, variation in the churning temperature (within limits) does not affect the firmness of the butter to any marked extent. Low temperature wash water adds slightly to firmness, but either underworking or overworking results in a degree of firmness below the maximum attainable by working to the correct point. Storing butter at 16° F. over long periods does not improve its firmness

The influence of chemical composition of butterfat on the firmness of butter, J. Lyons (*Roy. Dublin Soc. Econ. Proc., 3 (1936), No. 2, pp. 19–38, figs. 3*).—Tests conducted in the course of this study show that New Zealand and Australian butters are much firmer than either Danish or Irish butters. Other determinations included the moisture content, melting point, and Reichert-Meissl, Polenske, saponification, and iodine numbers for butter samples from each of the above sources. The relatively low unsaturated fatty acid content and the high stearic acid content are believed to be the main causes of the

exceptional firmness of the New Zealand and Australian samples. From determinations of seasonal variation in the composition of Irish butter it is concluded that the great decrease in firmness of this butter at the beginning of the season and the increase with advance of season cannot be fully attributed to variations in chemical composition.

Changes in the acetylmethylcarbinol plus diacetyl content of butter, W. L. Slatter (*Natl. Butter and Cheese Jour., 27 (1936), Nos. 20, pp. 20–24; 21, pp. 18, 20, 22, 24–26*).—This report from the Iowa State College indicates that acetylmethylcarbinol plus diacetyl is commonly produced in unsalted butter made with butter culture, but ordinarily is not produced in salted butter similarly made even though very little salt is added. The production of this substance was greater when 10, 15, or 20 percent butter culture was added than when 5 percent was used, and the addition of citric acid fermenting bacteria to the cream along with the butter culture increased its production in some cases, though not invariably. Higher storage temperatures and low pH in the butter favored its development. Unsalted butter regularly decreased in pH at higher holding temperatures, and the acetylmethylcarbinol plus diacetyl content declined following the point of maximum production, whereas salted butter maintained a relatively constant pH at various storage temperatures and showed little decrease in the content of this product.

Vitamin A activity of butter fat, T. S. Sutton and W. E. Krauss (*Guernsey Breeders' Jour., 50 (1936), No. 10, pp. 906, 907, 924*).—The Ohio Experiment Station has made a comparative study of the vitamin A activity and carotene content of the butterfat from Ayrshire, Guernsey, Holstein, and Jersey cows. Butterfat produced under winter feeding of alfalfa hay, silage, and grain was biologically assayed for vitamin A potency, using both curative and preventive methods with rats. Carotene determinations are reported both for winter-produced butterfat as above and for summer-produced samples when the animals had access to pasture. In all assays of vitamin A potency Guernsey and Holstein butterfats proved very similar in effect and somewhat superior to Jersey and Ayrshire butterfats, the latter two showing no significant differences in effect.

In an 8-week curative trial at relatively high fat intake and in an 8-week preventive trial all fats gave similar results, and only in the case of a 5-week curative trial at a relatively low fat intake did Holstein and Guernsey butterfat show marked superiority over Jersey and Ayrshire samples. On the basis of carotene content of butterfat under both winter and summer conditions, the breeds ranked as follows: Guernsey, Jersey, Holstein, and Ayrshire. Lack of correlation between carotene content and vitamin A activity is apparently due to inherent breed characteristics which regulate the degree of transformation of the food source of vitamin A (carotene) into the colorless form of vitamin A during the process of milk fat formation.

Tests of woods for butter containers with reference to imparting odor and flavor, E. M. Davis and G. C. Morbeck (*U. S. Dept. Agr., Misc. Pub. 250 (1936), pp. 4, figs. 2*).—In a study conducted at the Forest Products Laboratory, Madison, Wis., 14 species of native woods were tested under normal butter storage conditions over a 14-day period. Each species was tested when containing 6, 12, and 20 percent of moisture, both plain and paraffined. Butter samples were scored after 2, 7, and 14 days' storage. The various species in order of freedom from imparting odor and flavor to butter were white ash, white fir, soft maple, hackberry, sycamore, aspen, beech, yellow poplar, elm, black gum, basswood, cottonwood, red gum, and magnolia. The tendency of wood to impart odor and flavor to butter increased with increased storage time, and also

with increased moisture content of the wood. No species of wood having as much as 20 percent of moisture can be recommended for butter containers. The use of paraffin retarded but did not prevent the development of woody odors and flavors.

Bacterial flora in skimmilk powders, W. V. HALVERSON and F. MLEYNEK (*Northwest Sci., 10 (1936), No. 4, pp. 5, 6*).—This brief report from the Idaho Experiment Station gives the results of the examination of 30 samples of skim milk powder, including 13 spray process, 8 vacuum process, and 9 roller process lots, for bacterial flora. Molds were found in practically all samples, the numbers ranging from 0 to 30 per cubic centimeter of 10-percent solution. Yeasts were found in only two of the samples. Total bacterial count on standard nutrient agar ranged from 3,000 to 401,000 per cubic centimeter. Acid formers were present in all but two cases, while peptonizing bacteria and *Escherichia coli* were isolated in a few instances. The most recently prepared samples were generally higher in bacterial content.

Observations on the ripening of cheeses made from raw and pasteurized milk, I. R. SHERWOOD (*Jour. Dairy Res. [London], 7 (1936), No. 3, pp. 271–283, figs. 5*).—Continuing the study of factors affecting the ripening of cheese (E. S. R., 76, p. 96), the proteolytic action of rennet, pepsin, and trypsin on milk pasteurized at various temperatures has been investigated. It is shown that within a pasteurization range of from 140° to 160° F., and particularly between 150° to 160°, certain changes occur in the milk leading to increased proteolytic action of these enzymes. Further tests indicate that this condition is not due to alteration of the protein itself but is probably due to some change in the nonprotein constituents of milk. Applying these results to cheese-ripening studies, the difference in nitrogen partition as observed between cheeses made from raw milk and from pasteurized milk and ripened in the absence of bacteria can be largely accounted for on the basis of chemical alteration produced in the milk constituents by heat treatment.

The manufacture of blue cheese (roquefort type) from homogenized cows' milk, C. B. LANE and B. W HAMMER (*Iowa State Col. Jour. Sci., 10 (1936), No. 4, pp. 391–393*).—This paper presents preliminary results of trials in manufacturing roquefort-type cheese from homogenized cows' milk, both in small laboratory lots and on a commercial scale. By employing certain modifications in the manufacturing process as described a satisfactory cheese is produced which ripens in a short time and regularly has a white color and a desirable soft, flaky body.

Significance of laboratory tests in the control of ice cream, F. J. BABEL (*Ice Cream Trade Jour., 32 (1936), No. 9, pp. 35–37*).—In the microbiological analysis of ice creams, a comparison of media for determining the total bacterial count showed for tryptone-glucose-skim milk agar average counts approximately 2.5 times greater than those obtained by the standard method and also larger colonies. The average count and size of colonies obtained on standard agar plus 1 percent sucrose slightly exceeded those obtained by the standard method. Violet red bile agar proved superior to either sodium desoxycholate agar, formate ricinoleate broth, or brilliant green lactose peptone bile in the detection of the *Escherichia-Aerobacter* group. A direct relationship was noted between the total bacterial count and the yeast and mold content of ice cream.

Sodium alginate as a stabilizer for ice cream, M. J. MACK (*Ice Cream Rev., 20 (1936), No. 4, pp. 60, 62, 64; also in Ice Cream Trade Jour., 32 (1936), No. 11, pp. 33, 34*).—The Massachusetts Experiment Station presents experimental evidence that sodium alginate is a satisfactory cream stabilizer. The desired viscosity of the mix is attained without aging, thus permitting prompt freezing.

The mixes whipped readily to the desired overrun, and the finished ice cream possessed smooth texture and desirable melting characteristics. Methods for incorporating this product into the mix are outlined.

VETERINARY MEDICINE

[Report of work in animal pathology by the Florida Station] (*Florida Sta. Rpt. 1936, pp. 53, 56, 57*).—Investigations of hemorrhagic speticemia in cattle and swine, by D. A. Sanders; the effect of feeding colon organisms and dried whey on the bacterial flora of baby chicks affected with pullorum disease and the etiology of fowl paralysis, leukemia, and allied conditions in animals, both by M. W. Emmel; and plants poisonous to livestock in Florida, particularly *Crotalaria* (E. S. R., 75, p. 842), by Sanders, Emmel, and E. West, are referred to in this report of the work of the year (E. S. R., 75, p. 690).

The gizzard-worm and its transmission to chickens in Hawaii, J. E. Alicata (*Hawaii Sta. Circ. 11 (1937), pp. 7, figs. 4*).—Although invertebrate carriers of the gizzard worm of the chicken (*Cheilospirura hamulosa*) were previously unknown in Hawaii, recent investigations by the author have shown the flour beetle *Tenebroides nana* and the sand hopper *Orchestia platensis*, collected from poultry farms, to be naturally infested with infective larvae of this parasite.

In experimental work 2 of 8 laboratory-raised chickens that were fed upon 2,300 grasshoppers collected in an endemic area became infested with the parasite. Three species of grasshoppers (*Conocephalus saltator*, *Atractomorpha ambigua*, and *Oxya chinensis*), a species of sand hopper (*Orchestia platensis*), and 10 species of beetles (flour beetles—*Tribolium castaneum*, *Tenebroides nana*, and *Carpophilus dimidiatus*; beetles found around poultry manure—*Dactylosternum abdominale*, *Palorus ratzeburgi*, *Typhaea stercorea*, *Litargus balteatus*, and *Euxestus* sp.; and weevils—*Oxydema fusiforme* and the rice weevil) have been experimentally determined to serve as intermediate hosts.

The findings suggest that frequent removal of chicken manure from the poultry yards and prevention of fowls from eating beetles, grasshoppers, and sand hoppers are the basis of control measures for the gizzard worm.

Coccidiosis in chickens and other birds, A. J. Durant (*Missouri Sta. Bul. 372 (1936), pp. 12, figs. 4*).—A practical summary of information on methods applicable in combating coccidiosis in poultry and other fowl.

The immunizing value of commercial hemorrhagic septicemia aggressins, L. Van Es and J. F. Olney (*Nebraska Sta. Res. Bul. 87 (1936), pp. 16*).—In the course of tests to determine their immunizing value, 13 samples prepared by 7 different concerns were examined, rabbits as well as fowls being used as test animals. The aggressin doses were administered subcutaneously and each series of test animals was divided into 3 groups, the groups receiving the injections 1 week apart. The virus, consisting of 24-hour-old bouillon cultures of *Bacillus bipolaris*, was injected intravenously to all test animals 1 week after the last group had been treated with the aggressin. This arrangement was adopted in order to determine any possible influence exercised by the length of time between the aggressin treatment and the exposure to the virus.

"The injection of hemorrhagic septicemia aggressin failed to induce an adequate protection against a subsequent inoculation with *B. bipolaris*. The average mortality rate of the treated rabbits was higher than that of the corresponding virus controls. Animals inoculated with the virus 3 weeks after the aggressin treatment showed on the average a higher death rate than the virus controls, whereas that of the groups similarly inoculated 1 and 2 weeks after receiving aggressin treatment approached the mortality rate of the control

rabbits. No substantial advantage was gained by treating the test animals with aggressin more than once. The only influence of aggressin treatment consisted of an apparent tendency to prolong the survival periods of the animals dying within 120 hr. and of a greater number surviving beyond that space of time as compared with corresponding virus controls.

"Aggressin-treated rabbits which survived the inoculation with a *B. bipolaris* of greatly reduced virulence showed a conspicuously higher mortality rate than the original corresponding virus controls when 3 weeks later the entire group was again injected with a larger dose of the same virus.

"The treatment of fowls with hemorrhagic septicemia agressin failed to induce an adequate protection against a subsequent inoculation with the fowl cholera bacillus. In fowls treated with aggressin a marked influence on mortality or survival periods by the length of time elapsing between the aggressin treatment and the administration of the virus could not be observed. The injection of more than one dose of aggressin into fowls failed to bring about a degree of protection different from that of the birds treated only once. An adequate degree of immunity was not induced in aggressin-treated fowls exposed to fowl cholera by swabbing their palatine clefts with virulent material. In one group of fowls exposed to fowl cholera in the manner indicated the aggressin-treated birds showed a markedly lower mortality rate than the virus control birds, although their degree of protection cannot be regarded as adequate. Of the aggressin-treated fowls which were exposed to fowl cholera infection from 22 to 29 days and had survived, 50 percent were shown to still harbor the virus; whereas, of the corresponding virus control birds, only 23.8 percent were shown to harbor the infection.

"There is no reason to believe that the hemorrhagic septicemia aggressins of commerce can be depended on as a means of protection of livestock actually exposed to *B. bipolaris* infection."

The comparative study of nine presumptive test media, M. A. FARRELL (*Jour Amer. Water Works Assoc., 28 (1936), No. 5, pp. 611–622; abs. in Pennsylvania Sta. Bul. 336 (1936), p. 31*).—This is a more detailed account of comparisons between the newly suggested test media of the coli-aerogenes group of bacteria in water made by the station than that previously noted (E. S. R., 74, p. 847). See also a later note (E. S. R., 75, p. 688).

[Work with livestock diseases and parasites by the South Dakota Station] (*South Dakota Sta. Rpt. 1936, pp. 13, 15–19, 33, 34, 37, 46*).—The work of the year (E. S. R., 75, p. 691) is referred to as follows: The properties of oil of chenopodium, by J. W. Wilson and T. J. Le Blanc; alkali disease or selenium poisoning, by A. L. Moxon and W. E. Poley; and hemorrhagic septicemia, by C. C. Lipp.

A comparison of the minimum fatal doses of selenium, tellurium, arsenic, and vanadium, K. W. FRANKE and A. L. MOXON (*Jour. Pharmacol. and Expt. Ther., 58 (1936), No. 4, pp. 454–459*).—A study was made by the South Dakota Experiment Station of the relative toxicity of elements in addition to selenium that occur in the selenium areas known to produce toxic vegetation. "Rats were given intraperitoneal injections of Na_2SeO_3, Na_2SeO_4, Na_2TeO_3, Na_2TeO_4, Na_2HAsO_3, Na_2HAsO_4, $NaVO_3$, and $(NH_4)_6Mo_7O_{24}$. The minimum fatal doses were taken as the smallest doses which would kill 75 percent or more of the animals in less than 2 days. The minimum fatal doses as found are as follows: (1) Se as Na_2SeO_3, 3.25–3.5 mg Se per kilogram; (2) Se as Na_2SeO_4, 5.25–5.75 mg Se per kilogram; (3) Te as Na_2TeO_3, 2.25–2.5 mg Te per kilogram; (4) Te as Na_2TeO_4, 20–30 mg Te per kilogram; (5) As as Na_2HAsO_3, 4.25–4.75 mg As per kilogram; (6) As as Na_2HAsO_4, 14–18 mg As per kilogram; (7) V as

$NaVO_3$, 4–5 mg V per kilogram; [and] (8) Mo as $(NH_4)_6Mo_7O_{24}$, above 160 mg Mo per kilogram. No deaths were caused by injecting Mo in doses up to 160 mg per kilogram."

Locoine, the poisonous principle of loco weed (Astragalus earlei), G. S. FRAPS and E. C. CARLYLE (*Texas Sta. Bul. 537 (1936), pp. 18, figs. 2*).—An account is given of the isolation of the toxic principle of *A. earlei* in comparatively pure form, to which the name "locoine" is given. It has been found to be precipitated by phosphotungstic acid and to be recovered from the precipitate by treatment with barium hydroxide. "The base can be acetylated by acetic anhydride and the toxic principle recovered by extracting the water-insoluble material with chloroform, evaporating off the chloroform, and saponifying with sodium hydroxide. The base forms salts with acids. The tartrate, citrate, chloride, and oxalate have been prepared. The tartrate and citrate were toxic to cats; the oxalate was not tested. When precipitated by alcohol, the citrate and tartrate were not crystalline. They could be crystallized by dissolving in a little water and adding about four volumes of acetone. Small microscopic rhomboidal crystals were formed. Locoine is not precipitated by silver or mercury salts. The results of tests with a large number of alkaloidal reagents are described.

"The locoine was tested for selenium and none was found."

[Work in animal pathology by the Utah Station] (*Utah Sta. Bul. 276 (1936), pp. 7–10, 71, figs. 2*).—The work of the biennium 1935–36 (E. S. R., 72, p. 382) not previously noted includes the finding that immunity from Bang's disease through natural exposure may be transitory, by D. E. Madsen; that iritis is not transmitted by F_2 progeny of breeding hens, by Madsen and B. Alder; and that inconclusive results were obtained as to the relationships of soft-curd milk to subclinical mastitis, by R. L. Hill.

[Report of work in animal pathology by the Wyoming Station] (*Wyoming Sta. Rpt. 1936, pp. 12, 13, 14, 15*).—The work of the year referred to (E. S. R., 75, p. 103) includes a study of the presence of selenium in the soil and various plants, of poisonous constituents in the ground lichen (*Parmelia molliuscula*) and *Zygadenus gramineus*, the diagnosis of blackhead of turkeys, stiff lambs, roup in chickens, and cooperative work in the eradication of Bang's disease.

The curative treatment of surra in bovines, S. K. SEN (*Indian Jour. Vet. Sci. and Anim. Husb., 6 (1936), No. 3, pp. 215–233, pl. 1, figs. 3*).—In experimental work with bovine surra the administration of Naganol proved successful in seven of nine cases treated. It is considered desirable to repeat the dose once, and, if possible, even twice, at intervals of 1 mo., particularly when the animal is intended for export to countries known to be free from this disease.

Report of the veterinary division, 1935, H. V. M. METIVIER (*Trinidad and Tobago Dept. Agr. Rpt., 1935, pp. 44–46*).—The occurrence of and work of the year with livestock diseases are reported upon.

Ridding pasture of Taenia saginata ova by grazing cattle or sheep, W. J. and H. B. PENFOLD and M. PHILLIPS (*Jour. Helminthol., 14 (1936), No. 3, pp. 135–140*).—Experiments conducted in which a sheep and 2 calves were drenched with 3 doses each of 100,000 eggs of *T. saginata* led the authors to conclude that in all probability sheep will not acquire *Cysticercus bovis*. It appears that by grazing sheep or cattle under certain conditions pasture contaminated with *T. saginata* ova can be fr[...] re cleaning experiment the degree of acce[...] mental pasture at various times of testing [...]enting a reduction of effective accessible egg[...]er.

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Histologic features of the intradermic reaction to tuberculin in cattle, W. H. FELDMAN and C. P. FITCH (*Arch. Path., 22 (1936), No. 4, pp. 495–509, figs. 10*).—This contribution from the Mayo Foundation and the Minnesota Experiment Station cooperating reports upon a histological study of the later phases of the intradermic reaction to tuberculin in cattle, in which experimental and clinical material was used. "In 70 cases tissue was excised from the reactive areas of the caudal fold, and sections were prepared for histologic study. It was found (1) that the reaction to tuberculin is a rather definitely cellular reaction, predominantly histiocytic, and that it shows a predilection for the perivascular and perineural areas of the derma; (2) that while the local reactive process is confined in most instances to the papillary and reticular zones of the derma it may, if the inflammatory response is severe, extend into the tissues of the subcutis; (3) that there is no correlation between the intensity of the histologic alterations and the results of the tuberculin test as observed clinically; (4) that there are no distinguishing criteria in the histologic picture to indicate whether demonstrable lesions of tuberculosis are present in a given animal; and (5) that in all cattle in which these characteristic changes occur the uniformity of the reaction suggests the possibility of the existence of a common or closely related sensitizing agent."

Observations on Yellowstone elk, H. B. MILLS (*Jour. Mammal., 17 (1936), No. 3, pp. 250–253*).—The results of a study of the parasites, diseases, etc., of elk made during the course of the reduction of the Yellowstone herd undertaken early in 1935 are reported upon. Of the 11 diseases and parasites observed, the transmission of 9 is greatly aided by overcrowding and by feeding on overgrazed range.

Studies of physical properties and agglutinability of Br. abortus plate antigens from several sources, C. P. FITCH and C. M. THOMPSON (*Cornell Vet., 26 (1936), No. 3, pp. 222–230*).—Studies of plate antigens for the diagnosis of Bang's disease, conducted at the Minnesota Experiment Station over a number of years, have shown that there is a wide variety of products prepared in various ways. The results of tests of 13 antigens obtained from various sources, including official laboratories and commercial antigens purchased on the open market, are here reported upon, the details being given in seven tables. "Since these data were collected we have studied additional plate antigens from other sources and have found just as wide a variation. This study indicates the need of some method for the preparation of plate antigen which will insure a more uniform product for the diagnosis of Bang's disease. Some years ago nearly as wide a variation occurred with test tube antigen, but this has been corrected. . . . Some States are employing the plate test. It is also being used quite extensively in making diagnoses for interstate shipments in the private practice of many veterinarians, and for official work in some commonwealths. We firmly believe that the results of this study show clearly the necessity of using more uniform plate antigens than are now being employed for the diagnosis of Bang's disease."

The differential diagnosis of equine abortion, with special reference to a hitherto undescribed form of epizootic abortion of mares, W. W. DIMOCK and P. R. EDWARDS (*Cornell Vet., 26 (1936), No. 3, pp. 231–240*).—Following a brief history of the occurrence of and work with abortion in mares in the United States, the authors report upon further work by the Kentucky Experiment Station (E. S. R., 69, p. 433). The finding that the abortions met with in mares immunized against *Salmonella abortivo-equina* are due to a filtrable virus is reported. On the basis of present knowledge abortion among mares is grouped under four headings: (1) *Salmonella* abortion, (2) streptococcic

abortion, (3) virus or epizootic abortion, and (4) abortion due to miscellaneous causes. Transmission experiments with virus abortion in which mice, rabbits, guinea pigs, and mares were used are reported upon. In a number of outbreaks a convalescent serum obtained 30 days following abortion was injected intravenously or subcutaneously. Administered as a preventive for virus abortion, it has not protected mares already infected. It was observed in the field that no abortions occur after from 14 to 21 days following injection of the serum.

For the prevention and control of abortion in brood mares it is recommended that (1) all the pregnant mares be vaccinated against *Salmonella* abortion each year, 2 or 3 mo. following the close of the breeding season; (2) only healthy mares be mated to healthy stallions and kept under scrupulous cleanliness to prevent streptococcic abortion; (3) the brood mares be kept in small groups so as to minimize the possibility of the spread of epizootic abortion and other infectious diseases; and (4) that the brood mares be kept healthy, reasonably free of parasites of the digestive tract, and fed a ration of hay and grain that contains all the essential elements of nutrition.

The incidence and types of streptococci in first-calf heifers at parturition, W. T. MILLER (*Cornell Vet., 26 (1936), No. 3, pp. 241–248*).—In the studies reported samples of colostrum were collected immediately after parturition from each quarter of the udders of 100 first-calf heifers from a herd containing cows affected with chronic streptococcic mastitis.

"Streptococci were found in the first samples from one or more quarters of 27 animals. Second samples were not obtained from 7 of these cases. In the remaining 20 cows, streptococci were not present in 12 at the second examination. Altogether, 38 strains of streptococci were isolated. These strains fell into 20 different groups according to their behavior in differential media. Many of the strains resembled streptococci which can be found on the skin of the animal or in the stable and litter. *S[treptococcus] agalactiae* was found in 3 animals at the first examination."

Two cases of infection due to Clostridium histolyticus in the horse, E. R. FRANK and J. P. SCOTT (*Cornell Vet., 26 (1936), No. 3, pp. 252–257, figs. 3*).—Reports are contributed from the Kansas Experiment Station on two cases of infection with *C. histolyticus* recently treated.

How mastitis has been controlled in New York State dairy herds, D. H. UDALL (*Cornell Vet., 26 (1936), No. 4, pp. 324–330*).—A review of the results obtained in the control of mastitis in dairy herds in New York, with special reference to the methods employed.

Report of investigations of cattle poisoning around Payne Lake, Jefferson County, New York, W. M. EVANS (*Cornell Vet., 26 (1936), No. 4, pp. 337–341*).—Investigations made of the loss of dairy cattle from poisoning due to algae or other organisms consumed in lake water are reported upon. A list is given of 10 forms of blue-green algae, protozoa, and green algae found present. The symptoms observed in the affected animals were similar to those described by Fitch in his report of "water bloom" poisoning in Minnesota (E. S. R., 71, p. 241).

A case of tetany with hypomagnesemia in a dairy cow, H. J. METZGER (*Cornell Vet., 26 (1936), No. 4, pp. 353–356*).—A case report contributed from the Kentucky Experiment Station.

Pathogenicity and virulence of certain bacteria, C. A. BRANDLY and R. GRAHAM (*Science, 84 (1936), No. 2179, p. 315*).—In continuation of earlier work by Brandly at the Kansas Experiment Station with filtrable viruses (E. S. R., 74, p. 399; 75, p. 546), the authors report upon observations in Illinois of the

effect of introducing several species of bacteria into developing eggs of the chicken and other domestic fowl.

"With given strains of freshly isolated *S[almonella] pullorum* the extent and severity of the lesion produced as well as the survival time of the embyro were quite definitely and uniformly correlated with the quantity of the inoculum and the virulence of the culture for baby chicks.

"These results suggested the possible adaptability of the method of egg inoculation for determining the pathogenicity and for ascertaining the virulence of various strains and species of bacteria. In investigating this hypothesis the preliminary observations here recorded were confined to inoculations upon the chorioallantoic membrane of eggs incubated 10 to 15 days prior to treatment. The cultures used represented four strains of *Brucella abortus* var. *bovis* and *suis*, three strains of diplococci of equine origin, three strains of hemophilic bacteria isolated from the upper respiratory tract of young chickens, eight species of *Salmonella*, and three species of *Pasteurella*. Eggs employed as controls were injected with the sterile suspending medium or with suspensions of the various bacteria killed by heat. Proof of infection of the embryo and/or its membranes was established by the production of gross lesions and direct pure culture isolation of the organism inoculated.

"The cultures of diplococci and hemophiles appeared virtually devoid of pathogenicity for the developing egg even in the relatively large quantities employed (as much as 0.2 cc of the undiluted 15- to 24-hr. broth cultures). These two groups of organisms in other trials were not proved to possess specific pathogenic properties for the homologous host. *Brucella*, *Pasteurella*, and *Salmonella* cultures were lethal to the embryo in very dilute concentrations, while the control suspensions of dead organisms produced no more than slight local injury to the extra-embryonic tissues and were seldom associated with the death of the embryo.

"Marked differences in virulence for developing eggs were manifested between smooth stock and freshly isolated cultures of *Salmonella* and *Pasteurella*. Simultaneous comparative titrations with *Pasteurella* cultures on 2- to 10-day-old chicks revealed a correlation in results, although much less definite and uniform than in the egg inoculation method. The *P. avicida* culture, when inoculated subcutaneously, killed chicks in dosages 10 times smaller than were required with the *P. equiseptica*, while *P. cuniculicida* required larger doses than *P. equiseptica*. For eggs the *P. equiseptica* and *P. cuniculicida* required dosages approximately 10 times greater than did *P. avicida* to kill chicken embryos within 48 hr. Intracranial inoculations of the *P. avicida* and *P. equiseptica* strains into a group of nine horses gave results which could be interpreted as validating the titrations upon eggs and chicks. However, the more uniform and accurate measurements of virulence obtained by egg inoculation as compared to animal inoculation emphasize the superiority of the new method.

"The delicacy with which differences of pathogenicity and/or of virulence among strains of certain bacteria may be determined by inoculating the developing avian egg suggests that this method may also be utilized to detect alterations in these characters among variants of a certain strain."

The relative value of methods of examination for chronic mastitis of the bovine [trans. title], G. J. Hucker and P. A. Hansen (*Lait, 14 (1934), Nos. 133, pp. 226–248, pl. 1, figs. 2; 134, pp. 337–356, fig. 1*).—This contribution from the New York State Experiment Station deals with the methods that have been proposed for the detection of chronic mastitis. Reports of earlier work by Hucker have been noted (E. S. R., 74, p. 258).

On the treatment of undulant fever with Fouadin, C. Z. NEUMAN (*Lancet [London], 1936, I, No. 18, pp. 1001, 1002*).—A report is made of eight cases of undulant fever due to *Brucella* which were treated by intramuscular injection of Fouadin (antimony bispyrocatechin disodium sulfonate), in the gluteal region with (in adults) 1.5 cc on the first day, 3.5 on the second day, followed by from 4.5 to 5 cc on alternate days. In the treated cases there were no waves of fever after the first, although such waves are one of the characteristics of the disease. It was found that Fouadin apparently does not influence the onset of certain complications or sequelae such as arthritis.

Undulant fever treated with Fouadin, G. M. TANNER (*Lancet [London], 1936, II, No. 12, pp. 684, 685*).—A case report on undulant fever resulting from *Brucella* infection treated with the new antimony preparation Fouadin in the manner described by Neuman, above noted, in which there was no unfavorable reaction and the temperature began to subside after the second dose, complete recovery taking place in 8 weeks.

Annual report of the veterinary department for the year ended 31st December 1935, R. L. L. HART ET AL. (*Uganda Vet. Dept. Ann. Rpt., 1935, pp. 20*).—Included in this report (E. S. R., 74, p. 540) are accounts of the occurrence of and control work with infectious diseases of livestock and with *Glossina morsitans.*

The development of Theileria dispar in the bovine and in the tick Hyalomma mauritanicum [trans. title], E. SERGENT, A. DONATIEN, L. PARROT, and F. LESTOQUARD (*Ann. Inst. Pasteur, 57 (1936), No. 1, pp. 30–55, pl. 1, figs. 6; also in Arch. Inst. Pasteur Algérie, 14 (1936), No. 3, pp. 259–294, pl. 1, figs. 10; abs. in Rev. Appl. Ent., 24 (1936), Ser. B, No. 10, pp. 246, 247*).—An account of the biology of the causative organism of Mediterranean coast fever, a form of bovine piroplasmosis, and in *H. mauritanicum,* the tick vector. A list is given of 38 references to the literature.

The sylvatic plague committee, K. F. MEYER, (*Amer. Jour. Pub. Health, 26 (1936), No. 10, pp. 961–969*).—This report relates to the purpose and duties of a committee on plague among wild rodents, authorized by the western branch of the American Public Health Association in July 1935.

Two types of epizootics give rise to correspondingly different human epidemics. The form for which wild rodents serve as the great reservoir (72 species definitely known to suffer from spontaneous plague) spreads slowly from colony to colony, invariably independent of man's lines of communication, and is, as a rule, located in deserts or steppelike countries. It is epidemiologically rural plague, and so different from rat plague that the name sylvatic plague has been applied to it by R. Jorge.

Enzootic haematuria (haematuria vesicalis) of cattle in South Australia, L. B. BULL, C. G. DICKINSON, and A. T. DANN (*Austral. Council Sci. and Indus. Res. Pam. 33 (1932), pp. 24*).—An account is given of this affection as it occurs in a restricted area in South Australia.

The distribution of the gastro-intestinal parasites of sheep in Queensland, F. H. S. ROBERTS (*Queensland Agr. Jour., 46 (1936), No. 1, pp. 30–37, fig. 1*).—In this discussion of the occurrence of intestinal parasites of sheep in Queensland, a table is given recording the frequency with which the 23 helminths considered were found in the 122 viscera specimens examined.

Vaccination of sheep: Technique adopted, R. N. WARDLE (*Jour. Dept. Agr. Victoria, 34 (1936), No. 10, pp. 537–540, figs. 5*).—A description is given of the method employed in the vaccination of sheep against black disease and of sheep or lambs against enterotoxemia (pulpy kidney).

Report of the division of entomology and pathology, A. F. Bell (*Queensland Bur. Sugar Expt. Stas. Ann. Rpt., 36 (1936), pp. 19–27, fig. 1*).—The work of the year (E. S. R., 75, p. 808) referred to relates particularly to the grayback cane beetle *L[epidoderma] albohirtum*, the New Guinea sugarcane weevil, armyworms, and wireworms (*Lacon variabilis*). Brief reference is made to the introduction of the giant toad *Bufo marinus* from Hawaii.

[Pullorum disease (bacillary white diarrhea) in Australia], T. G. Hungerford (*Agr. Gaz. N. S. Wales, 46 (1935), No. 8, pp. 469–471, figs. 2; 47 (1936), No. 11, pp. 648–650, fig. 1*).—A brief practical account is given, in the first contribution, of this disease in New South Wales, where, because of the loss caused, some commercial poultry farmers have found it impossible to continue in business. The later account considers some of the more important features of the disease among chicks and reports upon it as a disease of adult fowl.

Control black disease in sheep by using bluestone for snail destruction (*Agr. Gaz. N. S. Wales, 47 (1936), No. 7, p. 364*).—Reference is made to the control work with black disease in sheep, due to *Clostridium oedematiens*, through the use of copper sulfate for the destruction of the intermediate snail host of the liver fluke.

Mastitis from the standpoint of a practitioner, C. H. Case (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 2, pp. 137–153, figs. 5*).—A discussion of the importance and the practical application of the newer knowledge in the detection, treatment, and control of mastitis in the dairy herd.

Pyelonephritis of cattle and horses, W. L. Boyd and L. M. Bishop (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 2, pp. 154–162, figs. 2*).—This practical summary of information, based upon a review of the literature and observations at the Minnesota Experiment Station, considers the etiology, symptoms, diagnosis, pathology, and treatment of pyelonephritis as found in cattle and horses.

Control of parasites in sheep, J. H. Rietz (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 2, pp. 163–170*).—A practical discussion of the sheep parasite control problem, based upon work at the West Virginia Experiment Station.

The use of acidophilus milk in the treatment of dysentery of young animals, J. N. Shaw and O. H. Muth (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 2, pp. 171–175*).—Contributing from the Oregon Experiment Station a brief account is given of the successful treatment of lambs, calves, colts, and pups for dysentery through the use of milk soured by *Lactobacillus acidophilus*. It is pointed out that the milk to be effective must be properly made and cared for.

Field observations on the incidence of fowl leukosis in hatching eggs and chicks, B. A. Beach (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 2, pp. 194–202*).—A brief report is made of studies of fowl leucosis conducted on 14 Wisconsin farms where it had not appeared until the spring of 1935. In all cases the symptoms first appeared in chicks. In 12 instances the chicks came from three hatcheries, while in the 2 others they were hatched from eggs produced on the farm. One of the flocks was shown to be infected, while in the other flock the source of the infection was not determined.

Observations on anaplasmosis in Idaho, G. W. Stiles, Jr. (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 2, pp. 212–214*).—A report is made of the occurrence of anaplasmosis in a herd of adult grade Herefords, this being the first record of its occurrence in Idaho. It is now known to occur in 19 States of the Union.

[Contributions on Bang's disease] (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 3, pp. 268–305*).—The following contributions on Bang's disease were presented at the annual meeting of the United States Live Stock Sanitary Association at Chicago in December 1936 (E. S. R., 75, p. 101): Progress in the Federal-State Bang's Disease Program, by A. E. Wight (pp. 268–272); Area Work in Bang's Disease Control, by H. C. Givens and R. E. Brookbank (pp. 273–284); The Attitude of the Breeder and the Milk Producer Toward the Control of Bang's Disease, by W. S. Moscrip (pp. 287–291); and Experiences in the Control of Bang's Disease in California, by K. G. McKay (pp. 292–301). The contributions are followed by a Report of the Committee on Bang's Disease, by C. P. Fitch et al.

Experiments with crystal-violet hog cholera vaccine, T. W. Munçe (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 3, pp. 307–319*).—A report is made of preliminary experimental work, the details of which are given in five tables. It is pointed out that the work reported is not sufficiently comprehensive to justify definite conclusions regarding any phase of the subject yet investigated.

Progress of hog cholera control with tissue vaccine, W. H. Boynton, G. M. Woods, and F. W. Wood (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 3, pp. 321–325*).—The authors have found (E. S. R., 70, p. 534; 74, p. 542) that the tissue vaccine method produces an adequate immunity, markedly reduces the possibility of losses from pneumonia or enteritis, and therefore can be satisfactorily substituted for the simultaneous method. It is pointed out that the progress obtained with this method, which does not introduce active virus into the field, suggests the brightest outlook for hog cholera control thus far.

Swine pox, C. Murray (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 3, pp. 326–330*).—A brief report of a study of a few pigs in Iowa from a herd showing a high incidence of swine pox infection.

Anthrax in swine, L. Van Es (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 3, pp. 331–340*).—A summary of anthrax as met with in swine.

A discussion of factors influencing the course of coccidiosis, E. E. Tyzzer (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 3, pp. 341–346*).—In the course of this discussion the nature and etiology of chronic coccidiosis and some of the problems having to do with certain aspects of coccidial infection, concerning which very little is known, are taken up.

[Contributions on bovine tuberculosis eradication work] (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 3, pp. 353–373*).—The following contributions on bovine tuberculosis eradication were presented at the annual meeting of the United States Live Stock Sanitary Association at Chicago in December 1936 (E. S. R., 75, p. 101): Progress and Status of Cooperative Tuberculosis Eradication Work, by A. E. Wight (pp. 353–358); Reaccreditation of Range and Semi-Range Modified Accredited Tuberculosis-Free Areas, by W. J. Butler (pp. 358–363); Problems and Policies in Completing Tuberculosis Eradication, by H. R. Smith (pp. 363–369); and Report of Committee on Tuberculosis, by J. L. Axby et al.

The epidemiology and control of equine encephalomyelitis, E. Records (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 3, pp. 373–380*).—A contribution presented at the annual meeting of the United States Live Stock Sanitary Association at Chicago in December 1936.

Experimental vesicular exanthema of swine, A. B. Crawford (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 3, pp. 380–395, figs. 2*).—The findings in experimental studies of an exanthematous disease in hogs resembling foot-and-mouth disease, but which occurs only in California, are reported. Four strains of

virus (A, B, C, and D) from different sources in the outbreaks of 1933 and 1934 were studied. Each of these strains appeared to be a distinct type, causing an immunity to the homologous type but not to the other three. Two of the types (B and D) were infectious only for swine, while the other two types (A and C) were infectious for horses as well. Cattle, sheep, goats, guinea pigs, and hedgehogs were not found to be susceptible to any of the four types of virus. Experimentally, this disease was communicable as a result of direct infection, but relatively only slightly so as a result of indirect infection. Hogs recovered from vesicular exanthema are susceptible to vesicular stomatitis as well as foot-and-mouth disease. Studies of vesicular exanthema suggest a closer relationship to vesicular stomatitis than to foot-and-mouth disease, but definitely indicate vesicular exanthema to be a separate though closely related disease.

Paratyphoid infection of fowls, P. R. Edwards (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 3, pp. 403–408*).—This contribution from the Kentucky Experiment Station reports on some of the newer developments in the knowledge of paratyphoid infection of fowls and calls attention to the direction which study of the problem is taking. It is concluded that, since four types of Salmonellas are definitely known to be transmitted through the egg in several species of domestic fowls, there can be little doubt that other species may be egg-borne.

Fowl-pox vaccination of day-old and older chicks.—Second report, R. E. Lubbehusen and J. R. Beach (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 3, pp. 430–446*).—This further contribution (E. S. R., 75, p. 110) reports upon a comparison of the effects of vaccination of chicks at the ages of 1 and 27 days and of the weight gains and mortality of chicks vaccinated at the age of 1 day with those of nonvaccinated controls to the age of 10 weeks, the vaccination of chicks at the ages of 1, 13, and 28 days compared on the basis of weight gains and mortality with nonvaccinated controls, and the vaccination of chicks at the ages of 1, 21, and 42 days and of groups of chicks at the ages of 1, 75, 89, 103, and 117 days, the details being given in five tables.

Vaccinating day-old and older chicks, R. L. Lubbehusen and J. R. Beach (*Nulaid News, 14 (1937), No. 11, pp. 35–37, 63*).—This practical contribution is based upon the work above noted, which is summarized as follows:

"(1) Fowl pox vaccinations of day-old chicks resulted in a systemic reaction sufficient to cause a temporary inhibition of growth gains and a lowering of vitality for variable periods thereafter. During the period of lowered resistance, exposure to unfavorable environment or concurrent disease may result in excessive mortality. (2) Vaccination between the ages of 2 and 6 weeks was followed by a systemic reaction of slower onset and one that became less and less severe as the age at vaccination increased, compared with the reaction of day-old vaccinated groups. (3) Vaccination between the ages of 75 and 117 days, even though the birds were vigorous, was followed by a systemic reaction which became increasingly severe as the vaccination age increased. This systemic reaction caused a temporary inhibition of growth gains. In birds vaccinated at these ages, as in those vaccinated between the ages of 1 and 42 days, the mortality following vaccination shock is largely dependent upon the vigor of the birds and the unfavorable factors to which they may be subjected."

Fowl cholera, L. Van Es (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 3, pp. 446–450*).—A practical summary of information on fowl cholera.

[Annual administration report of the Madras Civil Veterinary Department for the years 1934–35 and 1935–36], P. T. Saunders et al. (*Madras Civil Vet. Dept., Ann. Admin. Rpts. 1934–35, pp. II+37+8, pl. 1; 1935–36, pp.*

II+52+8).—Accounts of the occurrence of and control work with diseases and parasites of livestock are included in these annual reports (E. S. R., 73, p. 537).

Variation in animal viruses: A review, G. M. Findlay (*Jour. Roy. Micros. Soc., 56 (1936), No. 3, pp. 213–299*).—In this review, which is presented with a 15-page list of references to literature, more than 30 animal viruses are considered. "The variants observed are of two types: (1) Variants associated with pathological lesions unlike those produced by the parent strains, but without any great antigenic difference; (2) variants associated with pathological lesions like those produced by the parent strains, but with considerable antigenic difference, the antigenic differences being, as a rule, quantitative rather than qualitative in character.

"Both types either occur naturally or can be produced artificially under laboratory conditions. If a variant virus exhibits a high degree of antigenic difference and at the same time produces new pathological lesions an apparently new disease entity has arisen. Virus variants may appear as a result of growth in (1) the same species and the same tissue, more commonly either in (2) the same species and a different tissue or in (3) a different species and a different tissue. When virus variants appear in the same species and the same tissue no explanation is forthcoming as to why the variants should become dominant. No essential difference is to be found between the variations of animal viruses and those occurring in unicellular and multicellular organisms. It is suggested that certain virus variants are true mutations, others are akin to Dauermodifikationen, though in viruses, where there seems little or no possibility of contrasted parts corresponding to nucleus and cytoplasm, the distinction between Lamarckian and genetic variation virtually breaks down. The occurrence of virus variants throws light on the nature of animal viruses, for it is difficult to explain the variations observed except by regarding viruses as organized living entities."

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Florida Station], B. S. Clayton and A. Daane (*Florida Sta. Rpt. 1936, pp. 125–127*).—The progress results are briefly presented of a cooperative study with the U. S. D. A. Bureau of Agricultural Engineering relating to the effect of water control on peat and muck soils.

[Agricultural engineering investigations by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 336 (1936), pp. 17–19*).—Progress results are briefly presented of investigations on electric refrigeration on dairy farms, by R. U. Blasingame and J. E. Nicholas; stop hitches for tractors and corn and potato production with mechanical power, both by Blasingame and A. W. Clyde; artificial curing of alfalfa and other forage crops, by Clyde and C. O. Cromer; temperature distribution as a function of electric brooder performance, by Nicholas and E. W. Callenbach; and a vacuum milk cooler, by Nicholas.

[Agricultural engineering investigations by the South Dakota Station], R. L. Patty and T. M. Olson (*South Dakota Sta. Rpt. 1936, pp. 5–8, 19*).—Progress results are briefly presented of investigations on field machinery hitches for tractors and large horse teams (E. S. R., 75, p. 406), rammed earth for farm building walls (E. S. R., 75, p. 703), corn harvesting machinery, protective coverings and life of steel fence posts, rammed earth walls in poultry house construction, and making ice in an insulated well.

[Agricultural engineering investigations by the Utah Station] (*Utah Sta. Bul. 276 (1936), pp. 49–54, figs. 3*).—Progress results are briefly presented of investigations on drainage and irrigation conditions in Millard County, snow

surveys, effect of deep cultivation on water penetration, and irrigation efficiency, especially methods of irrigation and the needs for corn.

Groundwater law in Arizona and neighboring States, G. E. P. SMITH (*Arizona Sta. Tech. Bul. 65 (1936), pp. 43–91, figs. 5*).—This bulletin discusses ground water law in Arizona and neighboring States to aid in the proper consideration of any further litigation, to stimulate widespread discussion to precede any new legislation, and to give ground water users an understanding of the nature of water rights.

Determining flood discharges from small watersheds, D. L. YARNELL (*Agr. Engin., 18 (1937), No. 1, pp. 13, 14, figs. 4*).—In a brief contribution from the U. S. D. A. Bureau of Agricultural Engineering a graphic method of representing the direct relationship between the amount of rainfall and flood discharges is described. This makes it apparently possible to predict flood magnitudes and frequencies from fragmentary or short-period data.

Supplemental irrigation in the humid region (*Agr. Engin., 18 (1937), No. 1, p. 28*).—This is the report of the committee on supplemental irrigation of the American Society of Agricultural Engineers. Data are presented for 33 States indicating total acres irrigated amounting to 947,292, of which 26,623 are irrigated by sprinkling systems and 841,351 by surface-flooding methods.

Terrace cross sections as influenced by soil, crops, land slopes, and farm machinery, A. T. HOLMAN (*Agr. Engin., 18 (1937), No. 1, pp. 5–8, fig. 1*).—This contribution from the U. S. D. A. Bureau of Agricultural Engineering outlines some of the factors that seem important in terrace design and points out some of the variations of terraces in size, shape, and capacity.

It is concluded that although difference in soil type eventually may influence the design, construction, and operation of terraces, present information does not justify radical departure from conventional terrace design and specification. The rate and quantity of run-off from terraced land vary materially for different crops, but equally large variations in run-off and erosion occur for the same crop in different stages of its growth and for different seasons and climatic conditions. Present data indicate that it is an unsound practice to lower the standard of terraces on the assumption that cover crops, including legumes and small grains, and rotations and strip cropping will greatly reduce run-off and erosion from the most damaging rains.

The degree of land slope continues to be the dominant factor in determining the spacing of terraces and in limiting the width of terraces. Present data and experience indicate that conservative spacing of terraces should be continued.

Terrace construction should be accomplished in a manner that prevents the development of a furrow at the base of the terrace on the lower side. Tillage and maintenance practice should be so accomplished that a unform slope of soil will develop from the crown of a terrace to the bottom of the channel of the next lower terrace. A net terrace height of 13 in. has conveyed flows of 6.1 sec.-ft., but the cross section and channel were large. New terraces should have a minimum height of 18 in., if the spacing, length, and grade are normal.

Good terraces have been effective in preventing from 80 to 85 percent of the erosion occurring for different crops. The conservative design of terrace cross sections requires ample channel area to prevent overtopping and adequate size and stability of the ridge to prevent breaking.

The fundamental approach to tillage and traction research problems, R. W. TRULLINGER (*Agr. Engin., 18 (1937), No. 1, pp. 17–19*).—In a brief contribution from the U. S. D. A. Office of Experiment Stations a historical review of accomplishments in tillage and traction is presented as a background

for an exposition of some of the soil dynamics problems involved in the development of these practices and means for their solution.

Rubber for roadless tractors and trailers, A. Hay (*Rubber Growers' Assoc., Rubber and Agr. Ser. Bul. 3* (*1936*), *pp. 13, figs. 11*).—The use of rubber in the traction mechanisms of track-laying type tractors is briefly described and illustrated.

The development of a low cost hay drier, J. W. Weaver, Jr. (*Agr. Engin., 18* (*1937*), *No. 1, pp. 25–27, 46, figs. 7*).—This paper reports the progress results of investigations conducted by the Tennessee Valley Authority on combination natural field curing and artificial curing of hay. The studies have related primarily to the development of low-cost equipment for artificial drying to supplement the conventional field drying. These have included tests of various devices, including the introduction of warm or heated air under pressure into entire haymows of barns.

The barn tests showed that the kilowatt-hour consumption of electricity per dry ton varied greatly throughout, dependent largely upon initial moisture content of hay, variety of hay used, air conditions, and the need for observations requiring power beyond that necessary to complete the normal drying cycle. Further observations are necessary before any definite average figure can be given, and then it will vary with the variety of hay being dried.

Little difficulty was experienced in drying clean hay of the small stem varieties, such as alfalfa and lespedeza. The higher the grass content in the hay the more difficult it was to dry. The large stem varieties of hay, such as Mammoth Yellow soybean, proved difficult in that the drying was slow and drawn out over a long time. Present indications are that drying is as rapid with intermittent blowing as with continuous blowing, but further observations are needed to find the extent to which this is true. Indications with this plan of drying are that a barn with a haymow of from 20- to 40-ton capacity can be equipped for drying the season's hay crop with an investment of about $300.

Most of the tests conducted to date dealt with hay of above the average grass and weed content. Weather conditions were at times adverse, though a period of 3 or 4 days of rain and high humidity is yet to be encountered during the critical drying period of from 8 to 10 tons of hay. Further observations are believed necessary before this system can be declared entirely successful.

Distribution and costs of steam, electrical power, and labor in representative Idaho creameries, J. B. Rodgers, D. R. Theophilus, H. Beresford, and J. L. Barnhart (*Idaho Sta. Res. Bul. 12* (*1936*), *pp. 35, figs. 8*).—The results of a cooperative investigation are presented on the basis of equipment and costs per unit of each product processed. The study was conducted during the months of June, July, and August, one full month being spent in each creamery.

The boiler capacity at two creameries was 620 and 675 boiler horsepower, and the boiler efficiency averaged 74.8 percent. The cost of generating steam averaged 33 ct. per 1,000 lb. of steam where an average of 294,659 lb. was generated per day. The average steam consumption of the driers was 1.42 lb. per pound of milk evaporated. Steam consumption of the straightaway can washer was 2.9 lb. per can as compared with 2.2, 1.62, and 1.42 for the rotary washers.

The boiler horsepower required for the operation of the 720-can capacity straightaway can washer was 36.8 as compared with 11.96, 14.79, and 16.10 for the 360-can capacity rotary can washers. The average quantity of steam required to pasteurize 100 lb. of cream was 8.84 lb. The driers used 65 and 80 percent of the total steam generated at two creameries. The direct method of preheating milk for the driers required less steam than indirect heating and

decreased the capacity of driers, as the milk was diluted by the amount of steam condensed. Average steam used per 1,000 lb. of milk and cream received was 1,792.5 lb., or a cost of 59.1 ct.

Electrical power peaks can be eliminated by staggering power operations. A synchronous motor correctly operated will raise the plant power factor and lower power costs. A maximum demand limiting device aids in lowering power costs. Some pasteurizing vats were found to be overmotored. Churn motors operate under various degrees of load during a churning cycle, ranging from negative loads to overloads. Churns operated at rated capacity require less power per 100 lb. of butter churned than when operated below rated capacity. The long-barrel, small-diameter churn used less power per 100 lb. of butter than the short-barrel, large-diameter type of churn. The electrical energy required to churn fresh cream was 23.1 percent greater than was required to churn aged cream. Only one-half as much power was required to drive the drier rolls for buttermilk as was required for skim milk. The straightaway can washer used 1.83 kw.-hr. per 100 cans as compared with 0.93, 1.31, and 0.91 kw.-hr. for the rotary washers. The average energy consumption per 1,000 lb. of milk and cream received was 10.38 kw.-hr. when the average daily quantity received was 174,900 lb. The average energy cost per kilowatt-hour was 1.46 ct. when an average of 51,477 kw.-hr. per month was used.

Steam, electricity, and labor averaged 28.35, 13.45, and 58.20 percent, respectively, of the total energy cost of manufacturing butter and 78.55, 9.15, and 12.30 percent, respectively, of the total energy cost of manufacturing milk powder. Labor represented 70.9 and 68.84 percent, respectively, of the total energy cost of manufacturing ice cream and popsicles. The cost of electrical energy for manufacturing ice cream and popsicles averaged 29.95 percent of the total cost. The average total cost of steam, electricity, and labor used in manufacturing butter was 55.95 ct. per 100 lb. of butter, in manufacturing milk powder 81.52 ct. per 100 lb. of powder, manufacturing 1 gal. of ice cream 12.72 ct., and in manufacturing 1 doz. popsicles 3.218 ct.

Poultry house construction, F. C. Elford and H. S. Gutteridge (*Canada Dept. Agr. Pub. 506 (1936), pp. 47, figs. 45*).—This is a revision of a bulletin previously noted (E. S. R., 64, p. 81).

Tests of chick brooders, E. T. Swink (*Virginia Sta. Bul. 306 (1936), pp. 16, figs. 9*).—This bulletin reports the results of a series of tests on several types of brooders. The object was to determine (1) the fuel consumption of each type of brooder as a basis of comparing operating costs, (2) the comparative brooding results obtained, and (3) the most practical type of electric brooder for use on Virginia farms.

Six brooder houses approximately 9 by 12 ft. in dimensions were used. They were not insulated, had single thickness tongue and grooved floors, and their design was similar to the standard V. P. I. portable colony houses. The same principle of ventilation was used in all houses, and a uniform exposure was obtained.

The following brooders were selected: (1) Standard 56-in. electric with natural ventilation, (2) standard 56-in. electric with forced ventilation unit, (3) home-made electric using a 52-in. metal hover from a discarded fuel-type brooder, (4) home-made electric 72 by 30 by 9.5 in. constructed of wood, (5) commercial coal brooder, (6) commercial kerosene brooder, and (7) commercial wood stove. All electric brooders used in the test had "black heat" or low temperature heating elements.

The results of the tests show that probably too much stress has been placed on maintaining as uniform brooding temperatures as possible under the hover or canopy. Good brooding results may be had from electric, kerosene, coal, or wood brooders when properly operated. Where the labor item will not be considered in the cost of operating brooders, the most economical brooder will depend on the comparative cost of fuels at the place where the brooder is to be operated.

The ventilation of the brooder and brooder house is as important as the maintenance of a uniform brooding temperature. In the fuel-heated house the open fire removes large quantities of oxygen from the air and this must be replenished. In the electric brooder house no effort is made to heat the room and good ventilation is necessary to assist in keeping the litter in good condition.

The operating results with the converted electric brooder indicated that there is nothing to be gained by trying to convert old hovers into electric brooders. The increased current consumption soon makes up for the lower cost of rebuilding the brooder.

The home-made electric brooder, a plan of which is included, gave good brooding results with an average current consumption. The tests indicate that the principle on which this brooder operates is a good one. The design is such that good ventilation is assured and the distribution of heat under the brooder is uniform. The total cost of a brooder of this type is approximately $10, exclusive of labor.

No particular advantage could be noted in the operation of the commercial fan-type brooder over the standard commercial brooder. Although the mortality rate was slightly lower and the average weight per broiler produced was higher, these factors do not offset the increased investment and cost of operation.

During the coldest weather the floors under the litter, and especially under the hovers of the electric brooders, had a tendency to become damp. This was probably due to the prolonged damp weather and to insufficient ventilation during these periods. No ill effects on the chicks were noted as a result of this condition.

The firing of the wood and coal brooders, together with the handling of fuel and ashes, required considerably more time and labor than did other brooders. The kerosene brooder was second in labor requirements, but it was necessary to dismantle it twice during each of the three trials to remove soot.

The lowest temperature during the tests was 7° F. below zero, and the average outside temperature for the 10-week period was 29.7°. This test indicates that a well-insulated electric brooder will give good brooding results in an unheated brooder house in the coldest weather that is likely to occur in Virginia.

Methods of heating hotbeds, G. J. Stout, J. E. Nicholas, W. B. Mack, and D. C. Sprague (*Pennsylvania Sta. Bul. 338 (1936), pp. 22, figs. 10*).—This summarizes experiments conducted for 3 yr. on the heating of hotbeds by electricity, anthracite coal, kerosene, manufactured gas, and fermenting manure.

Vegetable plants of satisfactory quality were grown in hotbeds heated by each of these means, and all are deemed practicable if properly installed. The most important differences were economic, in cost of installation and operation and in convenience and dependability. Proper insulation and weather stripping of electrically heated frames reduced energy consumption approximately one-half as compared with similar frames not insulated or

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weather-stripped. Electrical energy consumption differed nearly 400 percent among the several methods of installation studied.

Coal heating is probably better adapted for the use of large commercial gardeners than for home gardeners and small commercial growers because of the cost of installation and because the commercial heaters are larger than is necessary for hotbeds less than 200 sq. ft. in area. The advantages of this method of heating are a relatively low cost of fuel and convenience of maintenance.

The commercial use of kerosene or gas must await the development of burners suitable for this purpose.

Manure is probably the cheapest means of hotbed heating for many farmers, especially where the fertilizing and soil improving value of the spent manure is considered. It is generally available on farms and, when properly managed, supplies plant food and maintains a steady heat. The chief disadvantage is that considerable care and skill are required for its most efficient use.

Effect of treatment on fence posts, J. C. Wooley (*Missouri Sta. Bul. 374 (1937), pp. 12, figs. 4*).—This bulletin presents the results of tests of 21 posts of 27 different varieties of post timber which were begun in 1913. Six different treatments were used.

Setting in screened gravel increased the serviceable life of fence posts 10 percent, although 22 varieties failed. Some varieties were more favorably affected than others. Honeylocust showed an increase of 100 percent, red oak 90, and black locust 59 percent, while white oak, black walnut, and a few other varieties were unfavorably affected by the treatment.

Charring for a distance of 4 ft. up from the base resulted in an increase of 4.4 percent in the serviceable life of the posts. Black locust showed an increase of 90 percent, but the oaks and walnuts seemed to be unfavorably affected by charring. On the whole, the practice did not show sufficient gains to make it worth while.

There was an average increase of 55.4 percent in the serviceable life of posts painted with 2 hot coats of carbolineum. The varieties showing the greatest gain from the treatment were honeylocust 218 percent, red oak 166, hackberry 160, ironwood 160, black oak 131, and black locust 89 percent.

On painting with 2 hot coats of creosote, honeylocust showed a gain of 59 percent, white oak 15 percent, and other common varieties practically no gain from the treatment. Very little penetration was secured with the creosote applied with the brush.

Submergence to a depth of 4 ft. for an hour each in boiling and cold creosote resulted in an average gain in 21 varieties of 10.7 percent. The gain on the varieties most favorably affected with the percentage gain over the check was willow 300 percent, black ash 238, red oak 230, ironwood 227, honeylocust 176, river birch 166, hickory 155, cottonwood 150, black walnut 112, and white oak 21 percent. The real test, however, was the cost per post year, and many of these varieties showed too high a post year cost to be economical.

The average gain in 19 varieties from submergence for 2.5 hr. each in hot and cold creosote was 131.3 percent. The varieties most favorably affected were red oak 300 percent, willow 312, ironwood 300, black ash 293, hackberry 230, hickory 228, river birch 222, cottonwood 140, honeylocust 135, black walnut 89, and white oak 30 percent.

Osage-orange posts were economical without treatment, although they are not well adapted for board fences on account of difficulty of nailing. Catalpa and white cedar posts also proved economical without treatment.

Black locust posts cost slightly less per year without treatment, but about the same for the post year when treated with carbolineum. White oak was

found satisfactory without treatment, but was most economical with the carbolineum. Sassafras was found satisfactory without treatment but showed some increase in economy with the carbolineum. White walnut should be given the carbolineum treatment to give sufficient life to be economical. White elm proved economical only when given the carbolineum treatment, and honeylocust was economical only when treated with carbolineum or creosote.

Electric fence as a control for livestock (*Oklahoma Sta.* [*Bien.*] *Rpt. 1935-36, pp. 175, 176*).—Progress results of investigations are briefly presented.

A study of the southern farm home in relation to comfort, J. W. Simons and F. B. Lanham (*Agr. Engin., 18* (*1937*), *No. 1, pp. 9, 10, 14, figs. 2*).—This is a brief description of the plan of a study which is being conducted cooperatively by the U. S. D. A. Bureau of Agricultural Engineering and the University of Georgia to develop more satisfactory types of low cost construction for farmhouses. The immediate objectives are to determine temperature, humidity, air motion, and lighting conditions in farmhouses; to evaluate the absorption of solor radiation and atmospheric heat by farm buildings; and to devise inexpensive structural means, including the utilization of agricultural byproducts and wastes, for maintaining satisfactory temperatures, humidity, and air-motion conditions in farmhouses and farm buildings.

AGRICULTURAL ECONOMICS

Proceedings of conference on statistical methods of sampling agricultural data (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. 82*).—Included are the following papers or summaries of papers presented at the conference of the Bureau and the departments of agricultural economics and mathematics and the statistical laboratory of Iowa State College, held at Ames, Iowa, July 14–17, 1936: Need for an Annual Sample Census of American Agriculture and Type of Data Desired by the Farm Credit Administration, by O. A. Day (pp. 3, 4); Sample Census of American Agriculture Type and Need From Census Standpoint, by Z. R. Pettet (pp. 4–7); Sample Census of American Agriculture, by W. W. Wilcox (pp. 7–9); Sample Census of American Agriculture—the Type of Data Required and the Need for an Annual Sample Census, by J. A. Becker (pp. 9–11); Problem of Selecting the Sample—Experience of Iowa State College in Selecting Farms, Sampling Used, and Results Obtained, by T. W. Schultz (pp. 11–14); Statistical Problems of an Annual Sample Census of American Agriculture, by C. F. Sarle (pp. 14–21); A Sample Farm Census in Alabama, by H. H. Schutz (pp. 21–27); Rural Carrier Acreage Survey in Ohio, by C. F. Sarle (pp. 28–31); Assessor's and Rural-Carrier Acreage Data in Iowa, by L. M. Carl (pp. 32, 33); Summarization of Experience of Division of Crop and Livestock Estimates With Individual Farm Data, by J. A. Becker (pp. 33, 34); Sample Census of American Agriculture, by W. H. Ebling (pp. 34–36) and by M. M. Justin (pp. 36, 37); Problems of a Sample Census, by G. W. Snedecor (p. 38); Problems of Assessor Enumerations—Iowa Experience, by C. D. Reed (pp. 39–43); Wisconsin's Experience With Assessors' Enumerations, by W. H. Ebling (pp. 43–46); Kansas Assessors' Enumeration, by H. L. Collins (pp. 46–48); Indiana Assessors' Enumerations, by M. M. Justin (pp. 49, 50); Problems of Assessors' Enumerations (pp. 51–53) and Air Photographs (pp. 53, 54), both by Z. R. Pettet; Objective Measurements in Crop and Livestock Estimation—Crop Meter, Cotton Boll Count, Measurement of Size of Cotton Boll, etc., by J. A. Becker (pp. 54–60); and Problems Arising in Connection with Taking an Annual Sample Census of American Agriculture, by C. F. Sarle (pp. 61–80).

The report and recommendations of the conference are included.

[Investigations in agricultural economics by the Florida Station, 1935–36] (*Florida Sta. Rpt. 1936, pp. 30–35*).—Results of investigations not previously noted are included as follows: Tables showing costs by items, returns, and other data for midseason oranges for the years 1932–33, 1933–34, and 1934–35, found by C. V. Noble, Z. Savage, and B. McKinley in a study of cost of production and grove organization of Florida citrus; some preliminary data as to methods of sales, prices, and cost of marketing found in a study of the effects of precooling and refrigeration on cost of marketing, quality, and price of citrus fruits, by A. H. Spurlock, Savage, and McKinley, in cooperation with the U. S. Farm Credit Administration; a table by Noble showing by years, 1928–32, the number of farms, acreage, assessed valuation, and amount of delinquent taxes in six counties; and the principal conclusions arrived at in regard to citrus, trucking, and general farming areas and specialized dairy and poultry farms in a study of farm adjustments and type-of-farming areas from the standpoint of agricultural adjustment and planning, by Noble and McKinley, in cooperation with the U. S. D. A. Agricultural Adjustment Administration and Bureau of Agricultural Economics.

[Investigations in agricultural economics by the Maine Station, 1935–36] (*Maine Sta. Bul. 384 (1936), pp. 408–427*).—In addition to results previously noted, data are included on the condition of buildings, type of roads, slope and utilization of lands, use of electricity, number of telephones, and classification of land, as found in a study of local market areas by C. H. Merchant and A. E. Watson; the costs of producing potatoes in Aroostook County (E. S. R., 75, p. 411); and as to the cost in 1934 of maintaining work horses and standard and general-purpose tractors on 90 central-Maine potato farms.

[Investigations in agricultural economics by the Oklahoma Station, 1934–36] (*Oklahoma Sta. [Bien.] Rpt. 1935–36, pp. 121–138, figs. 5*).—Results not previously noted include tables and text showing the average yearly labor income and rate earned by Garfield County farmers, 1929–35; effects of tenure status of operators on farm organization in the Stillwater Creek soil conservation project; relation of New York and Liverpool prices of cotton and of cotton prices to demand; relation of volume of business and number of patrons to net income and the side line business to the success of cooperative elevators; and numbers and amounts of farm chattel mortgages filed in 11 counties during the year ended October 31, 1934, and in Payne County, 1927–36, and the relation of the latter to farm cash income.

Current Farm Economics, [February 1937] (*Oklahoma Sta., Cur. Farm Econ., 10 (1937), No. 1, pp. 24, figs. 2*).—In addition to the usual tables of index numbers, articles are included as follows: Rural Zoning as a Means of Land Use Control in Oklahoma, by M. M. Blair (pp. 2, 3); Comparative Tax Load on Adjacent Farm Lands in Oklahoma and Surrounding States, by L. D. Melton (pp. 4–7); The New York Price of American Cotton is Closely Related to Prices at Other Futures Exchanges, by T. R. Hedges (pp. 7–13); Information on Soil Conservation, by P. Nelson (pp. 13–15); Possibilities of Cutting the Profit Margin Through Cooperative Enterprises, by A. L. Larson (pp. 15–17); Marketing Progress of One-Variety Cotton in Oklahoma and Other States, by C. B. Barre (pp. 17–20); and The Agricultural Situation, by T. R. Hedges (pp. 21, 22).

[Investigations in agricultural economics by the South Carolina Station, 1935–36] (*South Carolina Sta. Rpt. 1936, pp. 9–15, figs. 3*).—Included are findings as to (1) average labor income on the best farms and typical farms in a survey of farms in Greenville and Spartanburg Counties, by J. L. Fulmer;

the percentage of income absorbed by direct and income taxes in the years 1929–34, inclusive, and of the relation of assessed and actual value of farm real estate, by G. H. Aull and E. Riley; (3) the amount per acre of accumulated unpaid delinquent taxes on farm real estate in each year 1928–32 in 18 representative counties, found by Aull and Riley in a study in cooperation with the U. S. D. A. Bureau of Agricultural Economics and the Federal Emergency Relief Administration; and (4) a chart, by H. A. White, showing the percentages of various staple lengths of cotton produced in South Carolina, 1928–35.

[Investigations in agricultural economics by the Utah Station, 1934–36] (*Utah Sta. Bul. 276 (1936), pp. 75–79*).—In addition to results previously noted, brief summaries are given of some of the findings by W. P. Thomas, W. U. Fuhriman, and G. T. Blanch in a study of types of farming best adapted to Utah, and by Thomas and Fuhriman in a study of rural tax delinquency.

Foreign Agriculture, [January and February 1937] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 1 (1937), Nos. 1, pp. 50, figs. 11; 2, pp. 51–100*).—This monthly review of foreign farm policy, production, and trade will include "primarily the kind of material that has been embodied in the feature articles formerly appearing in *Foreign Crops and Markets*. The field that will be covered by these articles will, in general, fall within three broad classifications, (1) foreign government policies relating to agriculture, (2) foreign agricultural production, and (3) international trade in agricultural products." The articles "will consist largely of the results of special research or investigation conducted by the Washington staff or foreign field offices of the Bureau of Agricultural Economics and other bureaus of the Department of Agriculture, and adaptations from outstanding reports from American Consular offices. In addition, each issue will include a number of brief notes on outstanding developments in the foreign agricultural economic field."

No. 1 includes articles on Recent Developments in Soviet Agriculture, by L. Volin (pp. 3–28); Cotton Production in the State of Sao Paulo, Brazil, adapted from a report by P. O. Nyhus (pp. 29–42); and Agriculture in the German-Canadian Trade Agreements, based on a report by L. V. Steere (pp. 43–47); and miscellaneous notes on the results of dairy relief measures in the Netherlands, German fats and oils program, crop and livestock insurance in Bulgaria, and proposed distribution in Panama of land to poor farmers.

No. 2 includes articles on Danish Land Legislation, an Appraisal of Recent Trends, adapted from a report by J. W. Gannaway, Jr. (pp. 53–66); South African Agricultural Policy, by A. T. Murray (pp. 67–86); and Farm Relief Measures in the Netherlands, by H. E. Reed (pp. 87–97); and notes on adoption in Germany of new livestock regulations, proposed collective bargaining for French agricultural workers, and land tenure and agricultural labor in Chile.

A graphic summary of farm tenure (based largely on the census of 1930 and 1935), H. A. Turner (*U. S. Dept. Agr., Misc. Pub. 261 (1936), pp. [2]+52, figs. 71*).—This is one of a projected series of 10 publications prepared under the general direction of O. E. Baker for the purpose of bringing the graphic summary of American agriculture (E. S. R., 66, p. 477) up to date. These publications will be based on the 1930 and 1935 census reports and annual estimates of the Bureau of Agricultural Economics and will devote more attention to the economic and social conditions than the previous publications.

This publication was prepared in cooperation with the Resettlement Administration.

Land transfers in Cass County, North Dakota, 1875–1935, a period of sixty-one years, J. W. Porter (*North Dakota Sta., 1936, pp. [13], figs. 4*).—This study was made in cooperation with the U. S. D. A. Bureau of Agricultural Economics. Consideration was given to 33,430 deeds involving over 9,000,000 acres of land.

The number of transfers per year varied from 1,042 in 1882 to 263 in 1915. The transfers by different types of deeds were warranty 59.7 percent, quit claim 14.2, patents 17.2, sheriff's deeds 4.3, final decrees of distribution 3.2, and other 1.4 percent. Increasing population had little effect on average price per acre. There was little relation between size of purchase for full and true consideration and price per acre. No significant correlation between business activity in the United States and average price per acre during the period was noted.

Acquiring farm ownership by payments in kind, O. R. Johnson (*Missouri Sta. Bul. 378 (1937), pp. 12, figs. 4*).—A plan is outlined "to permit tenants to buy farms through annual product payments."

Incidence of the processing taxes under the Agricultural Adjustment Act: A selected list of references, compiled by L. O. Bercaw (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog., 68 (1937), pp. IV+46*).—"This is an annotated, classified bibliography of selected references to books, pamphlets, and periodical articles on the incidence of the processing taxes imposed under the Agricultural Adjustment Act." The classification is made by commodities.

Rural tax delinquency in Pennsylvania, 1928–1932, P. I. Wrigley (*Pennsylvania Sta., Jour. Ser. Paper 703 (1935), pp. [21]; abs. in Pennsylvania Sta. Bul. 336 (1936), p. 17*).—In cooperation with the U. S. D. A. Bureau of Agricultural Economics and the Civil Works Administration, complete records for 45 counties and partial records for 5 counties were obtained of the rural tax delinquency, 1928–32. In the analysis the counties are grouped by geographical location and character of the region, productivity of land, and average farm income.

In general, counties with the most intensive agriculture had the least delinquency both in proportion to the value of land and number of farms but a greater percentage of increase. In May 1933, approximately 20 percent of the farms were tax-delinquent and delinquency was 6⅔ times as great as in May 1929. The average delinquency in 1932 was approximately $20 per farm for all farms assessed.

The correlation of soil erosion and tax delinquency in the Piedmont area of South Carolina, B. M. Latham (*U. S. Dept. Agr., Soil Conserv. Serv., 1936, SCS-RB-1, pp. 22, figs. 2*).—Surveys were made in selected rural school districts in 13 counties in the Piedmont section of the State. The lands in each district were divided into two groups—the less and the more or badly eroded soils. Tables and charts show for each district for each group for the years 1928–32, inclusive, the percentages of properties, acres, and taxes delinquent, assessed valuation per acre, and the average (1928–32) number of properties, size of farm, and taxes paid per farm. The surveys for each county showed a positive correlation between soil erosion and tax delinquency.

Crop insurance: Selections and excerpts (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. [2]+26*).—Included are excerpts from the bulletin previously noted (E. S. R., 46, p. 787) on the history prior to 1922 and principles involved in crop insurance; an article by V. N. Valgren in 1925 on Insurance and the Farm Hazards;[a] and an address by the Secretary of Agriculture, H. A. Wallace, July 22, 1936. Also included are the letter of President Roosevelt

to Secretary Wallace on September 19, 1936, appointing a committee to prepare a report and recommendations for legislation providing a plan of "all risk" crop insurance; and an address of R. M. Green on October 13, 1936, outlining the history of the crop insurance movement since 1922 and dealing with some of the problems involved.

The farm outlook for 1937 (*U. S. Dept. Agr., Misc. Pub. 255 (1936), pp. IV+44, figs. 18*).—Continuing the series (E. S. R., 74, p. 554), "this publication summarizes the principal facts and conclusions of the thirteenth annual Agricultural Outlook Report prepared by the Bureau of Agricultural Economics in cooperation with representatives of the State agricultural colleges." The general outlook as regards domestic and foreign demand for farm products, prices for farm products, farm credit, taxes, farm labor, prices of building materials, farm machinery, and fertilizer, and farm family living is discussed. More detailed analysis is made of the outlook for cotton, wheat, tobacco, fruits, truck crops, sweetpotatoes, potatoes, rice, flaxseed, clover and alfalfa seed, peanuts, dry beans, tree nuts, feed grains, hay, pastures, commercial feedstuffs, hogs, beef cattle, sheep and lambs, wool, mohair, dairy products, chickens and eggs, turkeys, and horses and mules.

Agricultural outlook charts, 1937 (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, [1], pp. [6]+17, figs. 22; [2], pp. [6]+27, figs. 29; [3], pp. [5]+13, figs. 25; [4], pp. [6]+53, figs. 32; [5], pp. [3]+27, figs. 13; [6], pp. [6]+26, figs. 21; [7], pp. [6]+19, figs. 22; [8], pp. [53], figs. 68; [9], pp. [4]+15, figs. 15; [10], pp. [6]+35, figs. 45; [11], pp. [54], figs. 32; [12], pp. [4]+11, figs. 14; [13], pp. [4]+21, figs. 21; [14], pp. [4]+19, figs. 17; [15], pp. [37], figs. 31; [price list], pp. 32*).—These books of charts which supplement the outlook report above noted "have been selected by the Outlook Committees as those best adapted for presenting graphically the economic background for the respective commodities." The series includes beef cattle; cotton; dairy products; demand, credit, and prices; farm family living and summaries; feed crops (corn, oats, barley, hay) and total livestock; flaxseed, soybeans, peanuts, and cottonseed; fruits and nuts; hogs; potatoes and truck crops; poultry and eggs; rice, dry beans, and broomcorn; sheep, lambs, and wool; tobacco; and wheat and rye.

A price list of charts on different subjects suitable for outlook meetings and field meetings of farmers is also included.

An analysis of agriculture on the Valier irrigation project, P. L. Slagsvold (*Montana Sta. Bul. 330 (1936), pp. 47, figs. 19*).—This study was made to obtain an inventory of the physical and economic resources of the project and to suggest a method of farm organization analysis which may be helpful in bringing about a more stable agriculture. The development and present status of the project and its physical and economic characteristics are described. Analysis is made of the trends in crops grown, yields, number of livestock, farm ownership and tenancy, etc., on the project. Suggested budgets are included for an 80-acre and a 160-acre farm.

A land classification program for the agricultural lands of Oregon (*[Salem]: Oreg. Planning Council, 1934, pp. [1]+24*).—Procedure is suggested for collecting and analyzing the physical and economic data necessary as a basis for a land classification program. Tables show the estimated cost of a 5-yr. program and the status in 1934 of the different studies.

Cattle ranching and range utilization in western North Dakota, M. B. Johnson and R. D. Jennings (*U. S. Dept. Agr., 1937, pp. 96, figs. 7*).—This study, which is cooperative with the North Dakota Experiment Station and Extension Service, supplements that previously noted (E. S. R., 63, p. 884), and was made to ascertain the organization of beef cattle ranches and the ownership and use of grazing and croplands in western North Dakota. It is based on data secured

regarding 35 ranches in 1931 and 30 in 1932 and a study of 3 sample areas containing 864 sq. miles. The variations in ranch organization are discussed, and examples of representative ranches in the 3 classes of ranches are described. Range management and land utilization and range control in the area are discussed.

Some characteristics of cultivatable land in the sugar cane area of Louisiana, R. J. Saville and A. L. Dugas (*Louisiana Sta. Bul. 280 (1936), pp. 47, pl. 1, figs. 3*).—"This report, largely statistical in content, presents some characteristics of the land and its present and potential uses as found by a survey in 13 parishes forming the heart of the 'Sugar Bowl'." The data were obtained through interviews with the owners and operators of 6,672 tracts, the work being done in cooperation with the Emergency Relief Administration of Louisiana and the Works Progress Administration. In making the analysis of land use, size of tracts, cultivatable acreage, present sugarcane acreage, yields, production, man labor and work stock efficiency, regular and extra workers, etc., the tracts were divided into three classes on the basis of percentage of cultivatable land idle in 1934 and into size groups of from 1 to 99.9 acres, 100 to 999.9 acres, and 1,000 acres or more. Land ownership and milling and transportation facilities in the area are described.

Of the cultivatable land, 20 percent was idle in 1934. Sugarcane was the last previous crop on 49 percent of the idle land, rice on 15 percent, and cotton on 1.2 percent. In the period 1925–29, 40.1 percent became idle, and 19.3 percent in the period 1930–34. A desired acreage increase in sugarcane of 95.9 percent (198,188 acres) was shown by the reports obtained in the study, the proportions of increase for the different classes of land being no idle land 16 percent, all idle 14 percent, and partly idle 70 percent. The average yields of sugarcane per acre were 12, 12.8, and 13.3 tons, respectively, on the small, medium size, and large tracts. The yields were highest on tracts having no idle land. An increase in acreage of sugarcane to the desired level would require an increase of approximately 13,459 regular workers, an increase of 125 percent of the extra workers required for hoeing, and of 91 percent of those for harvesting. A considerable expansion in capital goods, mostly local products, would also be required.

Grade and staple length of cotton produced in Louisiana, 1928–34, W. B. Lanham, C. C. McWhorter, and I. M. Skinner (*U. S. Dept. Agr., Bur Agr. Econ., 1936, pp. [2]+41, figs. 16*).—This study was made in cooperation with the Louisiana Experiment Station. Tables, maps, and charts are included and discussed, showing the grades and staple lengths produced in the United States and each of the 4 sections and 16 subsections of Louisiana, the quality of cotton ginned in Louisiana during different periods of the cotton season, and the premiums and discounts for grade and staple length in central and local markets.

About 77 percent of the Louisiana cotton during the period was extra white or white in color and middling or better in grade and 42 percent was 1 in. or longer in staple length, as compared with 69 and 26 percent, respectively, for the United States. Of the ginnings prior to October 1, 87 percent were extra white middling or better as compared with 26 percent of the ginnings after January 15. The percentages of ginnings 1 in. or more in length were: Prior to October 1, 44; October and November, 38; December 1 to January 15, 40; and after January 15, 50. New Orleans market quotations per bale for the year beginning August 1, 1934, for good middling white ⅞-in. cotton averaged $2.25 higher than for middling ⅞-in. and $9.85 higher than for good ordinary cotton. Middling white 1⅛-in. cotton was worth $8.85 per bale more than ⅞-in. and $10.65 more than 13/16-in. similar cotton.

Wheat futures (*U. S. Dept. Agr., Statis. Bul. 54 (1937), pp. 108, figs. 4*).—This bulletin continues the series previously noted (E. S. R., 70, p. 708) by presenting data on the volume of trading, open commitments, and prices from January 3, 1933, to December 31, 1935.

Cost of production of tomatoes: Data from studies in 20 States, selected years, 1913–34, compiled by H. W. HAWTHORNE (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. 43*).—Data pertaining to cost of production found in studies by the Department, State experiment stations, and other agencies in 20 States from 1913 to 1934, inclusive, are presented.

Cost of production of citrus fruits: Data from studies in California and Florida, selected years, 1917–35, compiled by H. W. HAWTHORNE (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. 60*).—Data are compiled from reports of the Bureau of Agricultural Economics as to the average production, 1930–34, of different citrus fruits in different States; as to number of trees and acreage by age groups in Arizona, Florida, and Texas in 1934 or 1935; and as to costs of production found in studies made by the Department, State experiment stations, and other agencies from 1917 to 1935.

Florida truck crop competition.—I, Inter-State and foreign, C. V. NOBLE and M. A. BROOKER (*Florida Sta. Bul. 224, Sups. (1934), pp. [26]; (1935), pp [27]; (1936), pp. [25]*).—These supplements (E. S. R., 65, p. 886) include tables showing the weekly carlot shipments during the 1933–34, 1934–35, and 1935–36 crop seasons for different truck crops.

Charleston as a market for fruits and vegetables, W. W. ARMENTROUT (*West Virginia Sta. Bul. 279 (1937), pp. 40*).—This study was made to secure data concerning opportunities for marketing fruits, vegetables, and other farm produce as a guide in formulating agricultural production plans in connection with the Red House Homestead, a resettlement colony of the West Virginia Relief Administration. Analysis is made of the daily freight receipts for the years 1931–33, inclusive, and from January 1 to October 31, 1934, and of the sales and prices in the Patrick Street market during the summer of 1934. Tables show by semimonthly periods the receipts of the principal products by State of origin and other data. No attempt is made to predict future demand.

The Philadelphia fruit and vegetable market, F. P. WEAVER and F. F. LININGER (*Pennsylvania Sta. Bul. 336 (1936), p. 16*).—A brief statement is made as to findings in regard to the proportion of produce not passing through the Dock and Callowhill Streets wholesale markets and the produce sold by farmers through commission men.

Produce marketing in Reading and Wilkes-Barre, Pennsylvania, R. B. DONALDSON and J. GAUSS (*Pennsylvania Sta., Jour. Ser. Paper 720 (1936), pp. [2]+34; abs. in Pennsylvania Sta. Bul. 336 (1936), p. 17*).—This is a study of the sources of supply, methods of transportation, and types of outlets to consumers in the two areas during 1932.

Marketing problems in the apple industry.—Preliminary considerations (*U. S. Dept. Agr., Agr. Adjust. Admin., Gen. Crops Sect., 1936, pp. [2]+35, figs. 6; pp. [2]+19, figs. 3; pp. [2]+10, fig. 1; pp. [2]+20, figs. 3*).—These four studies discuss the trend in production and prices, competition of different sections and with other fruits, storage, foreign trade, factors affecting prices, etc. The first, by N. L. Gold, deals with the national situation; the second, by R. P. Callaway, with the eastern situation; the third, by C. I. Tod, with the central situation; and the fourth, by Gold, with the western situation.

An economic study of milk production costs in herds of producer-distributors in Maine, G. F. DOW (*Maine Sta. Bul. 385 (1936), pp. 51, figs. 4*).—This bulletin is based on data regarding production costs for the year ended April 30, 1935, from 108 producer-distributors in the Portland, Waterville, and

Bangor areas. Analysis is made of the effects on production costs of feed costs, man labor, use of buildings and dairy equipment, production per cow, size of herd, cow replacements, breed of cattle, butterfat content of milk, purebred v. grade cows, depreciation on cows, etc. The areas, utilization of milk, and dairy farm organizations are described and comparisons made of the production costs of producer-distributors and producer-wholesalers in the Portland area, and of production costs in the areas studied and the areas supplying Boston.

The average net cost of production in the Portland area was $2.55 per hundredweight of milk and $2.20 in the three areas combined. The costs for the Portland market are approximately 0.5 ct. higher per quart than in the areas supplying Boston.

Of the total production costs, feed comprised 58.2 and man labor 22.3 percent. Total costs increased about 0.25 ct. per quart for each increase of 0.3 percent in the butterfat test. Cows producing 5,000 lb. of milk annually were fed on the basis of 1 lb. of grain to every 2.8 lb. of milk produced, those producing 8,000 lb. on the basis of 1 lb. to 3.2 lb. of milk. The costs per hundredweight of 4 percent milk in 15 herds producing less than 5,000 lb. of milk per cow was $2.69 as compared with $1.68 in 10 herds producing over 9,000 lb. per cow. Costs decreased from $2.28 per 100 lb. of milk in herds of 20 or more cows to $2.06 in herds of under 15 cows.

Transportation of milk and cream to the New York market, H. R. VARNEY (*[New York] Cornell Sta. Bul. 655 (1936), pp. 79, figs. 15*).—This study was made to ascertain the volume of milk and cream moving from country plants to plants in the New York metropolitan area, the methods of transportation used, the changes in such methods, the costs of hauling by truck, and some of the factors affecting such costs. The increase in the use of trucks and of tank cars and tank trucks and the advantages of such uses are described.

The receipts of milk by rail increased from 1885 to 1930, then decreased approximately 50 percent to 1935. Receipts by truck increased nearly 600 percent from 1930 to 1935 and in the latter year were approximately 85 percent of the receipts by rail. Production in the metropolitan area decreased over 54 percent from 1885 to 1930 and 1935. Receipts of cream and plain condensed milk by rail increased rapidly from 1885 to 1930, then decreased over 40 percent to 1935. Receipts by truck in 1935 were approximately 3.5 percent of those by rail. The average daily per capita consumption in the metropolitan area in 1934 and 1935 was 0.65 pt. of milk and 0.04 pt. of cream. The seasonal variations in the receipts of milk were about 16 percent in the period 1910–14 and 11 percent in the period 1930–34. Over 98 percent of the milk and 95 percent of the cream during the period 1927–35 was from New York, Pennsylvania, New Jersey, and Vermont. From 1927 to 1934, inclusive, the percentage of milk from New York decreased from 79 to 66 percent, that from Pennsylvania increased from 10 to 17, that from New Jersey from 7 to 11, and that from Vermont from 2 to 4 percent. The average cost of operating trucks, average load 1,722 gal., was 15.5 ct. per mile, of which nearly one-third was drivers' wages, one-fifth depreciation and interest, and 14 percent gasoline. During the year ended June 30, 1933, over one-third of the rail shipments was in tank cars.

Cost of delivering milk in small cities with different types of conveyances, T. M. OLSON (*South Dakota Sta. Rpt. 1936, p. 20*).—A brief comparison is made of the costs of delivery with horses and with trucks in the city of Brookings.

Cost of operating farm motor trucks on grain farms (Northern Great Plains and Pacific Northwest, 1933), R. S. WASHBURN (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. 15, fig. 1*).—Data obtained from 1,674 farm operators, chiefly for the 1933 crop year, are analyzed and discussed. Tables show the number and size of, and crops produced on, farms with and without motor trucks by different types of farming areas, and the average costs by items in operating trucks of different sizes.

The farmer's share of the consumer's food dollar (*U. S. Dept. Agr. Leaflet 123 (1937), pp. II+6, figs. 2*).—Tables and charts are included showing by years, 1913–35, the retail and farm values, percentage of retail value received by farmers and for transportation, processing, marketing, and distribution, and amounts spent by consumers and received by farmers for 58 food products; the retail prices and prices paid producers for selected products in 1935; and food margins and wage rates, 1913–35. The technical study was conducted by R. O. Been and F. V. Waugh, and the leaflet prepared by C. B. Sherman. "In general it appears that the increased charges have been about in line with the increased costs, including processing taxes and higher wage rates."

Agricultural cooperative organizations in California (*California Sta. Mimeogr. Rpt. 56, pp. [1]+16*).—This is a list of these associations showing by counties the associations, their addresses, and commodities handled.

Farm value, gross income, and cash income from farm production, 1934–1935 (*U. S. Dept. Agr., Bur. Agr. Econ., Crop Rptg. Bd., 1936, pp. [2]+100*).—The data are shown by States and commodities.

Index numbers of production, prices, and income, J. I. FALCONER (*Ohio Sta. Bimo. Bul. 184 (1937), p. 40*).—This table (E. S. R., 76, p. 551) is brought down through October 1936.

Farm production and income from meat animals, 1924–1935 (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. [2]+135*).—"This report contains estimates of inventory numbers of meat animals and production, farm disposition, marketings, local prices, value, and income. The data are shown by States for the entire period, 1924 to 1935, for which such data are available."

Statistics relating to international trade in cotton and linters, 1921–1935, C. G. GRIES and A. T. TURNER (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, F. S. 67, pp. [2]+89*).—"This publication presents in detail the export and import trade in unmanufactured cotton from 1921–1935 for all countries in which such trade is significant. As of additional value, average exports and imports for 1909–1913 have also been included in the summary tables. . . . These statistics have been taken from the official publications of the various countries, supplemented in a few cases by reports from United States representatives abroad."

Cotton revisions: Acreage, yield, and production, crop years 1866–1935 (*U. S. Dept. Agr., Bur. Agr. Econ., Crop Rptg. Bd., 1936, pp. [1]+34*).—Tables prepared by the Crop Reporting Board show for the United States as a whole, by States, and for Lower California by years the acreages of cotton harvested, yields per acre, production of lint cotton and seed, and beginning in 1899 the ginnings reported by the Bureau of the Census.

Carlot shipments and unloads of nineteen important fruits and vegetables for the calendar years 1933 and 1934 (*U. S. Dept. Agr., Statis. Bul. 53 (1936), pp. 206*).—This bulletin supplements that previously noted (E. S. R., 72, p. 860) and shows the shipments by State of origin and by months, the relation of such shipments to shipments of all fruits and vegetables, and the unloads in 66 cities.

Relationships among watermelon prices, freight rates, production, and marketings, G. BURMEISTER and T. HULTGREN (*U. S. Dept. Agr., Bur. Agr.

Econ., 1936, pp. 33, pls. 10).—Tables and charts present data by years, usually 1925–35, as to acreages and production of watermelons in the United States, prices in New York City and Chicago, and the freight charges to these cities from important growing areas. Other tables include data by years, usually 1928–35, as to acreages, production, average farm price and value, freight revenues, etc., of cabbage, potatoes, melons other than watermelons, onions, tomatoes, and berries.

Apples: Yields, prices, returns per acre, and trend in plantings of important varieties of apples grown in selected districts of the East (Virginia, West Virginia, Maryland, Pennsylvania, and Delaware), W. H. YOUNGMAN, R. P. MATTESON, C. J. BLAIR, JR., and J. A. P. SAUNDERS (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. 55, figs. 5*).—This study was made in 1934 in cooperation with the U. S. Farm Credit Administration "to determine for each variety of major importance the yields, prices, and gross return per acre, as a basis for guiding growers in problems of orchard development and management."

Crops and Markets [January–February 1937] (*U. S. Dept. Agr., Crops and Markets, 14 (1937), Nos. 1, pp. 20, figs. 2; 2, pp. 21–48, figs. 2*).—Included are reports, summaries, charts, etc., covering crop and livestock estimates, market reports on livestock, livestock products, dairy and poultry products, feeds, seeds, grains, and cotton, and the price situation (No. 1 only) of important agricultural products. No. 2 includes the preliminary inventory as of January 1, 1937, of livestock on farms in the United States, with comparisons for 1935 and 1936.

RURAL SOCIOLOGY

Introduction to social research, E. S. BOGARDUS (*Los Angeles: Suttonhouse Ltd., [1936], pp. XI+237, figs. 17*).—Various methods of social research are presented in convenient form.

[Investigations in rural sociology by the Oklahoma Station], O. D. DUNCAN (*Oklahoma Sta. [Bien.] Rpt. 1935–36, pp. 138–140, fig. 1*).—Data are given on the social aspects of farm life, size of farm family as a factor in living conditions, recent population movements in Oklahoma, and city to farm migration.

[Investigations in rural sociology by the Utah Station] (*Utah Sta. Bul. 276 (1936), pp. 72–74*).—Progress results are briefly reported on the historical background of the Utah village, the extent to which edge-of-town farm families use village agencies, and the dependence of social advancement on social qualities.

County planning and zoning: Lists of enabling acts and commissions, C. I. HENDRICKSON (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. 30, figs. 8*).—This is an annotated list of the enabling acts and commissions for State, county, town, and township planning and zoning in the United States.

A preliminary report of land utilization of problem areas in North Dakota (*[Fargo]: N. Dak. State Planning Bd., 1935, pp. [1]+9*).—This is a brief general report by the consultant of the National Resources Board.

Preliminary report on State planning (*Oklahoma City: Okla. State Planning Bd., 1936, pp. [12]+295, [pls. 83]*).—This preliminary report includes chapters on the history, population, land use, occupations, industry, mineral resources, transportation, State public institutions, conservation by State departments, educational services by State departments, public improvements in Oklahoma, Federal agencies, relief, and planning in Oklahoma.

A compendium of maps and charts pertaining to State planning in Oklahoma (*Oklahoma City: Okla. State Planning Bd., 1936, pp. 133, [pl. 1, figs. 65]*).—This is a supplementary publication to that noted above.

The field of State planning, V. B. Stanbery (*Portland: Oreg. State Planning Bd., 1936, pp. [2]+11*).—This paper was presented at the Third Pacific Northwest Regional Planning Conference at Spokane, Wash., February 13, 1936.

Social planning for Canada (*Toronto: Thomas Nelson & Sons, 1935, pp. [XVI]+528, [fig. 1]*).—"Facts gleaned from many sources, not readily accessible to the public, have been assembled within the compass of one volume so as to give a comprehensive survey of conditions in Canada."

Social mobility in the farming occupation, B. O. Williams (*South Carolina Sta. Rpt. 1936, pp. 7–9*).—Data derived from a study of residential shifting among farmers in eight counties of the State are reported.

Rural population mobility in South Dakota, W. F. Kumlien (*South Dakota Sta. Rpt. 1936, pp. 44, 45*).—Some general findings in the study covering the years 1928–34, inclusive, in six counties representative of the more important types of farming areas are given.

Landlord-tenant relations and relief in Alabama, H. Hoffsommer (*[Auburn]: Ala. Relief Admin., 1935, pp. [3]+II+33, pl. 1*).—This report provides information on the relationships between landlords and tenants in the Alabama cotton region as of December 1933, especially as these relationships are associated with the administration of relief.

Roughly, 40 percent of the relief households were indebted to their landlords for debts of more than one year's standing. In a number of cases the exact amount of indebtedness was not known by the tenant. Over 90 percent of the 1,022 households questioned considered that they were better off on relief than they had been in recent years before the relief program was inaugurated. Current criticism that governmental programs designed to aid the sharecropper will ruin his powers of self-direction found no support in this survey, since the sharecroppers had already been pauperized more under the tenant system than would have been likely under any governmental arrangement.

The sharecroppers had profited little financially from agricultural adjustment payments since the bulk of the money received had passed on to the landlords in 60 percent of the cases.

Climbing the so-called "agricultural ladder" was largely a fiction for these families. Whereas only 9 percent of those who started out as croppers became owners, 8 percent of those who started out as owners became croppers.

The average tenure of sharecropper relief households was 3 yr. The Negro tenure was twice that of the white, and the average tenure of nonrelief tenants was longer than that of the relief.

Relation of education to social and economic status of farmers in Tennessee.—A preliminary report, C. E. Allred and B. D. Raskopf (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 29 (1937), pp. III+34, figs. 17*).—In each of the counties studied the white farmers with high school and college education have smaller families than do those with less schooling. There is little relation between the size of Negro farm-owner families and the education of the family head, but among Negro tenants the better educated family heads have smaller families. Among the families studied Negro farmers have larger families than white farmers in every educational group. White farm operators with better education have more conveniences, literature, and music in the home than do farmers of little or no schooling. Negro farmers have little in the way of conveniences, literature, and music. In all but one county the better educated white and Negro farmers operate larger farms and have more capital invested, larger farm labor incomes, and a greater net worth than do farmers of little or no education.

Education of farmers' wives and children in four counties in Tennessee, C. E. Allred and B. D. Raskopf (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 27 (1937), pp. IV+43, figs. 27*).—In each of the four counties studied 66 percent or more of the wives of farm owners and tenants combined have not gone to high school and less than 7 percent have attended college. In Williamson County in 1920, 13.7 percent of the wives of white farm owners and 9.7 percent of the wives of white tenants reported no schooling, while in Madison County in the same year all the white farm owner and tenant wives had some schooling. In Overton County in 1936 about 7 percent of the wives of farm operators reported no formal education. Negro wives have less education than white wives of both farm owners and tenants, and Negro farm boys and girls have less schooling in every age group than white children. Children of white farm owners have superior education compared with children of white tenants, but among Negro farm children there seems to be little difference in educational status as to tenure.

Farm housing in Tennessee, with regional comparisons, C. E. Allred and W. E. Hendrix (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 26 (1937), pp. II+45, figs. 25*).—The average value of all farm dwellings in Tennessee in 1930 was $602. Dwellings occupied by owners have an average value of more than twice that of tenant houses. The average number of rooms is 4.33. Nearly one-half of the houses are painted. White owners have an average of 5.02 rooms per dwelling compared with 3.92 for white tenants, 3.85 for colored owners, and 3.22 for colored tenants. A comparison indicates that "housing conditions in Tennessee are better than in either North Carolina or Arkansas. Farm dwellings in Iowa are better than those in the three southern States."

Rural youth: Activities, interests, and problems.—II, Unmarried young men and women, 15 to 29 years of age, W. A. Anderson ([*New York*] *Cornell Sta. Bul. 661 (1937), pp. 36*).—This second report (E. S. R., 75, p. 561) is based on data regarding 399 unmarried men and 359 unmarried women from 15 to 29 yr. of age, of whom 47 percent lived on farms, 34 percent in villages, and 19 percent in rural nonfarming territory.

Of the men, 40 percent were in school, 28 percent had full-time employment, and 22 percent part-time gainful work. For the women the percentages were 53, 15, and 8, respectively. More than 75 percent of the two groups had some high school or college training but about 75 percent had no vocational training for a specific occupation. Reading was the most important leisure-time activity. Membership in organizations averaged less than 1 for the men and slightly over 1 for the women. Of the men 56 percent and of the women 46 percent were not members of formal organizations. Forty percent of the entire group had no suggestions as to how the local communities could help young people.

Wisconsin rural youth: Education and occupation, J. A. James and J. H. Kolb (*Wisconsin Sta. Bul. 437 (1936), pp. 24, figs. 7*).—Five sample counties were selected and studied during the fall and winter months of 1934 with regard to education and to occupation. In the five counties there were 10,250 persons in the age group 20–25 yr. in 1928, and education and school attendance information was secured for 9,279 in this group in 1934. Comparisons of the elementary education of the group indicate that 71 out of every 100 farm young men and 60 out of every 100 farm young women had not gone beyond an eighth grade education. Of the 5,217 persons who had an eighth grade education or less, 51.4 percent were farm boys and 37.6 percent were farm girls.

Farming and homemaking on the farm were the chief occupations of the rural youth who lived in the country in 1933, farming being followed by 78.6

percent of the farm young men whose homes were on the farm in 1928 and homemaking by 49.4 percent of the farm young women. Only 16.2 percent of the village young men and 8.8 percent of the village young women were similarly occupied. The data indicate that over half of the farm young women leave the farm for pursuits in village or city, 39.7 percent of whom are housewives and 25.7 percent are in domestic or personal service.

The opportunity and output of the rural high school and the influence of agricultural instruction in the high school are discussed.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Interpretive science and related information in vocational agriculture: Effective utilization of scientific principles and related information in organized agricultural instruction (*U. S. Dept. Int., Off. Ed., Vocat. Ed. Bul. 191 (1936), pp. V+27, pl. 1*).—"This publication is designed primarily to provide teachers of vocational agriculture with subject matter and illustrative material regarding the place and use of scientific principles and related information as interpretive material in the instruction process."

The three parts discuss the relationship between agriculture, science, and related information; organizing teaching content to provide for interpretive science and related information; and examples of some effective uses of interpretive science and related information during the instruction process.

A basis for a proposed course of study in agricultural economics and farm management for departments of vocational agriculture in Missouri, G. J. Dippold (*Missouri State Bd. Vocat. Ed. Bul. 25 (1934), pp. 103, figs. 19*).—"The purpose of this study is to discover and report the outstanding problems in agricultural economics and farm management confronting farmers in Missouri in order that basis for a suitable course of study may be prepared for all day high school students in vocational agriculture." Data were obtained by questionnaires from teachers of vocational education, parents of students in such courses, all departments in the State having courses in agricultural economics and farm management, and former students in such courses. Expert opinions were solicited from agricultural economists in 12 States comparable to Missouri in agricultural conditions. Analysis is made of the replies of the economists, teachers, and farmers as to the importance of and from students as to the interest in the State objectives in pork, poultry, dairy, and beef cattle, sheep, fruit, corn, and wheat production and marketing, and of the replies of economists, teachers, and students as to the relative difficulty in State objectives in the different lines. Tables show the objectives in the several lines ranked on the basis of the findings in the analysis.

The general principles in course construction applied in the State are applied in the vocational departments in two cities representative of different situations. Teaching activities necessary to apply to the objectives set up in the study are discussed.

Dairy enterprises, J. C. McDowell and A. M. Field (*Chicago: J. B. Lippincott Co., [1936, rev. ed.], pp. VII+471, pls. 6, figs. [228]*).—This is a revised edition of the textbook previously noted (E. S. R., 63, p. 889).

The home economics omnibus, F. LaG. Harris and H. H. Huston (*Boston: Little, Brown & Co., 1935, pp. XIII+617, pl. 1, figs. 202*).—This volume covers the seven divisions of the standard home economics course in high schools, namely, foods and nutrition, clothing, home planning and furnishing, home management, child care and development, health, and family and other social relationships. To challenge the interest of the high school girl the text is written in an informal style and centers about the girl's life, with the

well-dressed girl, and the well-bred girl and her social relationships. Suggestions for class activities are given at the end of each unit, and books and other references are listed at the end of each division.

The research and educational activities of the station as relating to agricultural trends in New Jersey, J. G. LIPMAN (*New Jersey Stas. Bul. 616 (1936), pp. 20*).—The participation of the stations in the economic and social life of the State during the author's connection therewith since 1896, and especially during the period from 1911 to date in which he was director of the stations, is described.

On the front lines with agriculture: A report of extension work in agriculture and home economics in 1934 (*U. S. Dept. Agr., Ext. Work Agr. and Home Econ. Rpt., 1934, pp. [2]+80*).—In this report (E. S. R., 76, p. 269), the chief lines of work and the results obtained are discussed. Statistical tables (pp. 41–80) for finances and results are included, the former covering the year ended June 30 and the latter covering the year ended November 30, 1934.

The life and work of Seaman A. Knapp, R. CLINE (*Nashville, Tenn.: George Peabody Col. Teachers, 1936, pp. [7]+110, pl. 1*).—This biography (E. S. R., 24, p. 497) was prepared as a Ph. D. thesis in the George Peabody College for Teachers.

Workers in subjects pertaining to agriculture in State agricultural colleges and experiment stations, 1935–36, M. A. AGNEW (*U. S. Dept. Agr., Misc. Pub. 234 (1936), pp. V+133*).—This is the usual annual list (E. S. R., 73, p. 553) showing the workers in agriculture and home economics.

Workers in subjects pertaining to agriculture in land-grant colleges and experiment stations, 1936–37, M. A. AGNEW (*U. S. Dept. Agr., Misc. Pub. 254 (1937), pp. V+135*).—This is a list similar to that noted above.

FOODS—HUMAN NUTRITION

[Foods and nutrition studies at the Florida Station] (*Florida Sta. Rpt. 1936, pp. 62, 63, 70–72, 79, 80*).—In this annual report summaries, some of which cover an extension of work noted previously (E. S. R., 75, p. 717), are given by R. B. French on the vitamin C content of tomato, fresh celery leaves, and oranges; by H. W. Winsor on variations in the iron content of turnip and mustard greens grown on iron-deficient soils with and without fertilization; by C. F. Ahmann on the relation of growth to phosphorus, calcium, and lipin metabolism as influenced by the thymus and on the pathologic changes in the tissues of range animals suffering from "salt sick" and laboratory animals suffering from a deficiency of iron and copper before and after suitable therapy; by O. D. Abbott on the changes occurring in the white blood cells of adult rats in vitamin A deficiency and of malnourished adult humans before and after treatment with diets high in vitamin A and on the relation of anemia in the children of Alachua County to the iron content of home-grown foods; and by A. F. Camp and A. H. Stahl on the cold storage of citrus juices and quick-frozen citrus juices, strawberries, and Youngberries.

Foods and nutrition [studies at the Maine Station] (*Maine Sta. Bul. 384 (1936), pp. 397–401*).—This progress report (E. S. R., 75, p. 420) by M. M. Clayton includes some of the most outstanding results in the physical examination and diet survey of the food habits and nutritional status of children in selected communities in the State, and further data on the antiscorbutic value of home-canned pickles of various types.

Bread baking with dried yeast (*Wyoming Sta. Rpt. 1936, pp. 13, 14*).—A method developed at the station for bread making at high altitudes, using

The relative merits of the beater and whip and of size of mixing bowl on the results obtained with the A. A. C. C. basic cake-making method, H. R. FISHER (*Cereal Chem., 13 (1936), No. 5, pp. 603–608*).—This paper and the three which follow are subcommittee reports on cake-baking tests.

The mixing bowls were of 3-qt. and 10-qt. capacities equipped with wire whips and bronze beaters and operated by a 3-speed mixer. A commercially milled cake flour and a fancy soft clear flour were used in the basic cake-baking formula in which the quantity of soda and cream of tartar had been reduced 16.6 percent to allow for the high altitude (3,780 ft.). Specific gravity determinations were made on the flour and on the batter during the mixing period. Baking tests were made after 1-, 5-, and 10-min. mixing periods.

A smoother batter was obtained with both kinds of flour when the 10-qt. bowl and wire whip were used. The lightest batter with the clear flour resulted from the use of the 3-qt. bowl and wire whip. The results would indicate that beaters and whips are not interchangeable, particularly in the 3-qt. bowl, and that the bowl size and beater specified in the standard cake-baking method must be adhered to for standard results.

The sugar and shortening tolerance of soft wheat flours for cake making, L. COOLEY and J. R. DAVIES (*Cereal Chem., 13 (1936), No. 5, pp. 609–613, figs. 5*).—Following the standard cake-baking method, the authors tested two commercially milled flours—a fancy clear and a short patent—and one experimentally milled flour. The sugar content was increased 10, 20, and 30 percent and the shortening content 25 and 50 percent. In the baking tests the experimentally milled flour showed a sugar tolerance less than 10 percent, the fancy clear flour less than 20 percent, and the short patent flour less than 30 percent increase. The experimentally milled flour showed a shortening tolerance less than 25 percent and the fancy clear and short patent flours less than 50 percent increase. "With each increase in sugar the cakes became heavier, the grain coarser, the texture harsher, the crusts browner and flatter, until they finally fell. With each increase in shortening the cakes became heavier and greasier, the grain closer, and the crusts flatter."

Sugar tolerance in the A. A. C. C. basic formula for testing cake flours, W. E. STOKES and L. K. TRACK (*Cereal Chem., 13 (1936), No. 5, pp. 621–627*).—Series of cakes were made in which dry sugar and sirup were added to the basic formula in 10-, 20-, and 50-percent increments. The flour used had a tolerance to dry sugar equal to a 20- to 30-percent increase and to sugar in sirup form equal to a 10-percent increase over the basic amounts.

The control cakes made with all dry sugar and all sirup were identical in volume, with the latter of slightly better texture, more even grain, and clearer color. When the sugar was added in sirup form, the volume, texture, and grain ratings were decreased and the dense structure of the cake prevented collapse, although the tolerance point was not extended. When the sugar and liquid contents were each increased 10 percent, the volume of the cake was less than that of the all-sirup cake containing a 10-percent increment of sirup. When dry sugar was used and the water content was increased at the rate of 10 percent of the sugar increments, the cake did not collapse until the 40-percent sugar increment had been reached. When the sugar was dissolved in the milk solution of the formula the product was similar to the all-dry sugar cake, but with increased amounts of the sugar-milk sirup the volume became larger, the grain less even, and the tendency to collapse increased. When the amount of leavening agent was increased 5 percent with each 10-percent increment of sugar or sirup, the results indicated that the limits of

sugar tolerance may be extended by adding the sugar in the form of sirup of the same density as the original sugar-liquid combination in the mix when the leavening agent is also increased. It is recommended that for the purpose of determining the sugar tolerance of a flour the dry sugar should be used without any variable as to the method of adding the increments to the amount of sugar in the basic formula.

The technique of photography for permanent records of baking studies, L. Cooley and J. R. Davies (*Cereal Chem., 13 (1936), No. 5, pp. 613–620, figs. 13*).—The authors demonstrate the use of photographs, as prepared by Harrel (E. S. R., 64, p. 281) as one of the best available means of permanently recording the results of baking research.

Chemical composition and fermentation studies of citron, C. R. Fellers and E. G. Smith (*Jour. Agr. Res. [U. S.], 53 (1936), No. 11, pp. 859–867, figs. 3*).—In this investigation at the Massachusetts Experiment Station fresh unripe citron (*Citrus medica*) imported from Puerto Rico was subjected to fermentation and curing processes, and the fresh and cured products were analyzed for proximate and mineral composition and for vitamins A and C.

The fermentation process was similar to the commercial process followed with the Corsican citron, and the organisms isolated from the fermenting brine were the same, *Saccharomyces citri medicae* and *Bacillus citri medicae*. The fermented citron was found to soften and lose its characteristic flavor unless the brine was raised to a concentration of 10 or 12 percent after the fermentation was complete, or was treated with SO_2 or Na_2SO_3 in sufficient concentration to give from 200 to 500 p. p. m. of SO_2. The peel was preserved by the usual process of desalting the citron and building up, by the addition of hot sirup, a sugar concentration from 15 to 20 percent at the beginning to about 75 percent. A combination of glucose sirup with sucrose was found to give much better results than sucrose alone. The mixture found most satisfactory contained 65 percent of sucrose and 35 percent of glucose and the preserved citron from 70 to 74 percent total sugars, with a final moisture content of between 17 and 19.5 percent. The data on the composition of the experimentally preserved fruit are as follows: Moisture 18.81 percent, ash 0.48, protein (N $\times$ 6.25) 0.13, ether extract 0.33, crude fiber 1.37, total carbohydrate except fiber 78.85, calcium oxide 0.06, phosphorus pentoxide 0.038, and potassium oxide 0.021 percent and ferrous oxide 4.1 and cupric oxide 1.7 p. p. m.

The fresh green citron proved to be rich in vitamin C, 6 international units per gram, but there was little retention of the vitamin in the brined, fermented citron. The vitamin A content of the fresh green citron was estimated as from 0.8 to 1 international unit per gram on the basis of 1 Sherman unit being equivalent to 1.4 international units. The preserved citron contained slightly less vitamin A.

Nutrition in health and disease, R. McCarrison (*Brit. Med. Jour., No. 3951 (1936), pp. 611–615*).—In this paper, read before the Section of Nutrition of the British Medical Association, the author surveys the contacts established between nutrition and the other sections into which the clinical and scientific work of the association is divided.

Basal metabolism of girls, F. B. Talbot (*Amer. Jour. Diseases Children, 52 (1936), No. 1, pp. 1–15, fig. 1*).—The author discusses the various physiological factors which influence heat production and points out that the lack of understanding of these factors may explain some of the errors of clinicians in the past. He attempts to find where possible errors may occur, coordinate the findings, and select the standard that will be consistent with clinical experience.

He accepts the theory, agreeing with physiological and clinical fact, that heat production is primarily dependent upon the amount of active protoplasmic tissue in the body.

The standard procedure should be based on two basal periods with values checking to within 4 percent, the kymographic curve should show a regular swing of the recorder and a gradual upward incline, and the pulse rate should be low. A statistical study of the collected data on 2,200 children shows that the level of heat production differs in different parts of the country and, therefore, the standard should be corrected for each community. The increase in weight does not correspond so closely with the increase in metabolism as does the increase in height. The menstrual cycle causes a veriation shown by a premenstrual rise and a maximum fall of 5 percent during menstruation. The amount of protein ingested may be an important factor in affecting the basal metabolism level.

Comparing the new standard with other standards based on height, weight, and age, the author favors the assumption that weight standards more closely represent the clinical status. Select groups of children with cretinism and hyperthyroidism when tested demonstrated that the percentage deviation from the standard for weight was more consistent with the clinical status than was the percentage deviation from the standard for height. The conclusion is that the weight standard gives the most accurate clinical pictures, because the results obtained by it confirm clinical experience, the standard is statistically as accurate as other standards for older girls and is more accurate for young children, and it is also more accurate for pathological conditions and more consistent with the findings in cretinism and hyperthyroidism. The author urges clinicians to obtain actual basal data, know what a standard means and how it is constructed, and when they interpret findings to remember that there are normal physiological reactions which are capable of affecting the metabolism.

Menus and recipes for lunches at school, R. S. CARPENTER, H. N. HANN, and F. W. YEATMAN (*U. S. Dept. Agr., Misc. Pub. 246 (1936), pp. II+25*).—This publication contains information regarding the kind and amount of food to serve for the noon meal in nursery and day schools. Sample menus, large quantity recipes, and purchasing suggestions are given.

The relation of diet to the occurrence of gastric lesions in the rat, E. L. HOWES and P. J. VIVIER (*Amer. Jour. Path., 12 (1936), No. 5, pp. 689–700, pls. 2*).—Groups of young and adult rats, hooded and albino strains, were placed on a modified Pappenheimer-Larimore lesion-producing diet of flour and salt mixture (E. S. R., 53, p. 165). After 42 days 90 percent of the young rats developed stomach lesions, accompanied by anorexia, xerophthalmia, and failure to gain weight, while the adult rats remained free from these symptoms for 61 days. When the adult rats were starved every other day, 70 percent developed stomach lesions within 49 days. The young rats showed improved growth when adequate amounts of vitamins A and D were supplied, but 50 percent of them and 60 percent of the adult rats developed lesions. Carotene and butter supplements also failed to protect them. The addition to the diet of 5 percent whole yeast alone or in combination with 5 percent of cod-liver oil or 20 percent of casein protected the young rats, and an increased quantity of yeast the adult rats. When the amount of flour and salt mixture was restricted, 5 percent of whole yeast granted less protection than when a liberal amount of the diet was allowed or when other food factors were supplied. The addition of 10 percent of dried feces to the diet prevented the lesions. The ulcerations occurred in hypertrophied squamous epithelium in the rumen and glandular portions of the stomach. "There is no similarity between these lesions and peptic ulcer in man."

A technic for determining the rate of absorption of fats, M. H. Irwin, H. Steenbock, and V. M. Templin (*Jour. Nutr., 12 (1936), No. 1, pp. 85–101, fig. 1*).—In this contribution from the Wisconsin Experiment Station the authors describe a method of determining the comparative rate of absorption of fat from the alimentary tract of the rat. Adult male rats following a 48-hr. fast were lightly anesthetized, and by means of a urethral catheter 1.5 cc of melted fat was delivered directly into the stomach. In a similar manner 1.5 cc of fat was delivered into a beaker and weighed. When the desired time had elapsed, the animals were decapitated, and the stomach, small intestine, and cecum were immediately ligatured, removed, and separated, the intestine being cut into two parts and each section filled with distilled water. After 10 min. the contents were emptied into beakers. The sections were then filled with petroleum ether for 10 min. and after emptying, the organs were cut open and washed thoroughly. The contents were extracted in petroleum ether and the washings transferred to separatory funnels and extracted with petroleum ether. The four extracts were combined and anhydrous sodium sulfate added. The extract was then filtered and the sulfate washed thoroughly. After standing overnight the beakers were placed in a vacuum oven at from 92° to 95° C. for ½ hr. under a pressure of 610 mm of mercury and 2½ hr. under a pressure of 85 mm of mercury, cooled, and weighed.

To test the accuracy of the technic, groups of rats fed 1.5 cc of melted fat were immediately killed and between 95 and 100 percent of the ingested fat recovered. When a group of 7 rats was fasted 48 hr., killed, and the fat extracted by the above method, the mean weight of fat obtained was 0.0222 g, and this figure was applied as a correction to all calculations. Other tests demonstrated that age within the limits of the test, 4–7 mo., did not significantly influence the rate of fat absorption, and that the difference between the sexes was not statistically significant. Pregnancy was not a factor.

The chylomicron and the hemolipokrit methods for determining blood fat did not give comparable results, and neither method was found to be satisfactory for quantitative use. No definite correlations were found between the grams of fat absorbed and the body weight, body surface, or length of the intestines.

The comparative rate of absorption of different fats, H. Steenbock, M. H. Irwin, and J. Weber (*Jour. Nutr., 12 (1936), No. 1, pp. 103–111*).—Employing the technic outlined above, various fats were fed to groups of 10 or more rats and the percentage of fat absorbed at 2, 4, 6, 8, and 12 hr. was determined for 342 individual experiments.

Partially hydrogenated vegetable oils were absorbed as readily as lard or corn oil. Butter, halibut liver, and cod-liver oils were absorbed uniformly at a more rapid rate than lard, corn oil, or partially hydrogenated fats.

When 1.5 cc of fat was fed, the 4-hr. absorption period was found to be the most suitable one for comparing the rate of absorption. Under these conditions fats were absorbed in the following descending order of percentage: Linseed oil, olive oil, whale oil, soybean oil, peanut oil, rancid lard, cottonseed oil, cacao butter, coconut oil, palm oil, and oleo stock.

The effect of coffee and decaffeinated coffee on oxygen consumption, pulse rate, and blood pressure, K. Horst, R. J. Willson, and R. G. Smith (*Jour. Pharmacol. and Expt. Ther., 58 (1936), No. 3, pp. 294–304, fig. 1*).—In this further investigation (E. S. R., 72, p. 873), the subjects were 11 adults of both sexes, aged 23–28 yr., and 3 men aged 50, 57, and 73 yr., respectively. Caffeine was omitted from the diet for at least 2 weeks prior to the experiment and during the experimental period. The Benedict closed circuit helmet ap-

paratus was used in determining the basal oxygen consumption before the administration of coffee and decaffeinated coffee and ½ and 1½ hr. following their administration. Usually the two beverages were used on alternate weekly experimental periods on the same subject. The approximate caffeine content of the coffee was 1.15 percent and of the decaffeinated coffee 0.012 percent. The beverages were prepared by the dripolator method, 75–78 percent of the caffeine being extracted in the process. The following results were obtained from 26 experiments:

With caffeine-containing coffee the average increase of the percentage changes of oxygen consumption from the basal values was +8.3 for the ½-hr. tests and +9.27 for the 1½-hr. tests. With decaffeinated coffee the average values were +1.1 and −0.1, respectively. These results show a definite increase in oxygen consumption following the drinking of coffee and little, if any, change following the drinking of decaffeinated coffee. In the majority of cases the pulse rate was decreased and there was a slight rise in systolic and diastolic blood pressure following coffee administration, while negligent and inconstant changes were produced by decaffeinated coffee.

Further studies on copper and iron in metabolism, H. L. Keil and V. E. Nelson (*Jour. Lab. and Clin. Med., 21 (1936), No. 11, pp. 1119–1124*).—Both male and female rats of the first and second generations on a diet of milk supplemented with iron as $FeCl_3.6H_2O$ and copper as $CuSO_4.5H_2O$ in varying proportions were examined to determine whether or not the sterility in the second generation on the supplemented milk diet is due to degenerative changes in the sex organs as suggested earlier by Waddell (E. S. R., 66, p. 90). Metabolism studies were also conducted on the females.

No sterility or degeneration of the testes was observed in the male rats. The testicular weights of both first and second generation animals compared favorably with those on a stock diet. Motile sperm were found, and mating tests were positive. The average weights of paired ovaries from females on the supplemented milk diet were slightly lower than those of the controls on the stock diet, but the organs were normal, as judged by histological tests and by the successful mating of some of the animals with those on the stock diet. The ammonia nitrogen and creatine nitrogen values of the urine of animals on the supplemented milk diet were higher than the values obtained from animals on the stock diet or on milk alone. Creatinine nitrogen was also higher in the urines from animals on milk plus copper and iron than in the urines from animals on milk alone.

Calcium and phosphorus retention in growth, in relation to the form of carbohydrate in the food, M. Speirs and H. C. Sherman (*Jour. Nutr., 11 (1936), No. 3, pp. 211–218*).—Different forms of carbohydrate were mixed with twice their weight of an otherwise identical adequate control diet (Sherman diet B) and fed to young rats from 28 to 29 days old. At 60 days of age the rats were killed and analyzed for calcium and phosphorus. It was found that calcium retention and also phosphorus retention were essentially alike whether the carbohydrate added to the diet was dextrose, spray-dried corn sirup, dextrin, cornstarch, or sucrose. Within the limits of experimental error calcium utilization was alike on the experimental diets. The ratio of calcium : phosphorus was essentially the same for all animals, and at the end of the experiment the percentages of calcium and phosphorus in the bodies were essentially the same for the animals on the experimental diets as for those of the same age on the control diet.

Rickets in rats.—XV, The effect of low calcium-high phosphorus diets at various levels and ratios upon the production of rickets and tetany, A. T. Shohl (*Jour. Nutr., 11 (1936), No. 3, pp. 275–291, fig. 1*).—The author

extended and supplemented previous investigation of high calcium-low phosphorus diets (E. S. R., 68, p. 871) to include the low calcium-high phosphorus diets. During a 21-day period young rats were fed modifications of the Steenbock-Black diet 2965 consisting of 79 percent corn, 20 percent gluten, and 1 percent sodium chloride, with corn meal substituted for ground corn when lower phosphorus values were desired. By the additions of appropriate amounts of calcium and phosphorus, the calcium level was varied from 0.06 to 1 percent and the phosphorus level from 0.12 to 2 percent. The acidities of the diets were varied from +70 and +12 cc 0.1 N acid per 100 g of basal diets to from −365 to +495 cc 0.1 N acid per 100 g of diet. Galvanic electrical reactions to show the presence of tetany were determined weekly by the Shohl and Bing method (E. S. R., 60, p. 493). At the end of the experiment roentgenograms and histological examination of the bones, the latter by S. B. Wolbach, were made, and serum calcium and phosphorus, total nitrogen, and the percentage of ash in fat-free femurs were determined.

The results show that rickets may be present when the serum phosphorus or calcium, or both, are low, and that tetany occurs when calcium is low and phosphorus is high. As the calcium and phosphorus levels in the diet were increased at a given ratio, the serum calcium and phosphorus and the percentage of ash of the fat-free femurs also increased, while the rickets and tetany diminished. The nitrogen values remained fairly constant. In the absence of vitamin D it was found that rickets may be produced with low calcium-low phosphorus diets, as well as with low calcium-high phosphorus and high calcium-low phosphorus diets.

Vitamin studies on apples, I. A. Manville, A. C. McMinis, and F. G. Chuinard (*Food Res., 1 (1936), No. 2, pp. 121–140, fig. 1*).—Following the same procedure and employing the method of determining the vitamin A potency on the basis of the minimal protective dose as discussed in the previous study (E. S. R., 72, p. 880), the authors derive the following values for apples: Vitamin A—Arkansas Black 36 units, Baldwin 15, Delicious 24, Gravenstein 14–17, Jonathan 24, Spitzenberg 36, and Winesap 36 units per ounce; vitamin B complex—the results obtained with Delicious, Gravenstein, and Spitzenberg showed that they cannot be considered good sources; vitamin C—Arkansas Black less than 2.5, Gravenstein 3.75, Baldwin 2.5–3, Delicious less than 2.5, Jonathan 1.5–2, Spitzenberg 7, and Winesap 3 units per ounce. Tests with Winesap and Delicious apples demonstrated very little if any loss of vitamin A during prolonged storage. The amount of vitamin C destroyed during prolonged storage appeared to vary with the kind of apple, no change being noted in the Delicious, a slight loss in the Jonathan, and a marked loss in the Baldwin. Peeling the apple did not result in a marked decrease in the vitamin C content Further data are presented to substantiate the statement that the vitamin A and vitamin C values are associated with gene activitity rather than chromosome number.

New developments in nutritional value of apples as the result of research and clinical experience, I. A. Manville (*Better Fruit, 31 (1936), No. 5, pp. 3–5, 16–18*).—In this address, delivered at the annual convention of the International Apple Association in Boston, the author presents a review of his research studies during the past 4 yr. as noted above, and the findings of other investigators to show that the apple possesses great therapeutic advantages. The subject matter is concerned largely with the value of such food materials as the apple in maintaining normal balances in the stomach and intestine, supplementing the acid in the stomach when it is low, acting as a buffer and as a protective colloid in the intestine, and providing rich sources of materials for conjugation purposes so that the injurious effects of toxic

materials may be reduced. "Fruits such as the apple should be considered as being more than food. They are medicinal agents possessing both prophylactic and therapeutic powers."

The interrelationship of vitamin A and glucuronic acid in mucine metabolism, I. A. MANVILLE (*Science, 85 (1937), No. 2193, pp. 44, 45*).—The statement is made that by goblet cell counts of comparable areas of entire villi in the gastrointestinal tract a marked reduction has been shown in the number of mucus-secreting elements and an increase in the number of goblet cells in vitamin A deficiency. This exposes the lining of the tract to injuries produced by the solid components of the food or feces, resulting in capillary bleeding. "We believe that the occurrence of occult blood in the feces is the earliest evidence obtainable of a deficiency of vitamin A."

In an attempt to throw light on the mechanism of mucus production, rabbits on a diet of oatmeal and water were depleted of glycuronic acid by the administration three times daily by stomach tube of gradually increasing doses of menthol, which combines with glycuronic acid with excretion of menthol glycuronate in the urine. Animals which survived for from 2 to 4 days showed on autopsy ulcerative and erosive changes bearing close resemblance to those of vitamin A deficiency in the stomach, pylorus, gall bladder, and intestines.

It is suggested that the ulcerative and erosive changes in the gastrointestinal mucosa may be due to the presence in the body of toxins requiring conjugation with glycuronic acid for their detoxification, with consequent lowering in the amount of mucin formation. Vitamin A is considered to be involved in some way in this mechanism. "The fact that it does not seem probable that all the benefits enjoyed by vitamin A-deficient animals when fed whole apple [as indicated above] is due to vitamin A only is further evidence in this connection. More work is being done along this line, and it is hoped that more information will be provided in the near future."

The vitamin B complex, R. A. PETERS (*Brit. Med. Jour., No. 3957 (1936), pp. 903–905*).—In this communication to the section of nutrition of the British Medical Association at its 1936 meeting, vitamin B_1 (aneurin, torulin), lactoflavin, and vitamin B_6 are recognized as the most completely defined of the factors of the original B complex at the time of writing. Vitamin B_1 is discussed at considerable length as concerns its chemical nature, function, and tests and the effects of mild deficiency. The flavines and vitamin B_6 are treated very briefly, with the suggestion that the significance of lactoflavine is that it is part of the essential yellow oxidation enzyme of Warburg. The fact that it evidently cannot be synthesized by the animal, that it has been proved essential to rats, and is considered to be needed by dogs leads the author to state that "we must keep our eyes open for its application to man, though Dann [E. S. R., 76, p. 136] claims that it has no effect on human pellagra." Vitamin B_6 "seems to be the real antidermatitis factor and, therefore, must form the main constituent of the original vitamin B_2. (Its possible relation to pellagra in man must still be considered to be not properly defined)."

Other suggestions concerning the relation of the B vitamins to human pellagra are cited, as well as the relation of one or more of these vitamins to acrodynia or pink disease, to heart block, and to cataract.

An extensive list of literature references is appended.

The antineuritic vitamin (B_1) content of some seed oils [trans. title], V. ZAGAMI (*Quad. Nutr., 1 (1934), No. 4, pp. 284–294*).—Following the technic proposed by G. Amantea of determining the "beriberi quotient Q_b" in pigeons, and considering the antineuritic value of corn oil as 1, the following vitamin B_1 values were obtained: Almond 0, walnut 1.12, pippin 1.56, peanut 2.75, pistachio 4.08, sesame 4.08, pine 9.25, and sunflower seed oil 26.

Vitamin studies (*Oklahoma Sta. [Bien.] Rpt. 1935–36, pp. 75, 76*).—This progress report of studies by R. Reder on vitamins B and G includes a discussion of survival periods, food consumption, and weight losses of rats on different vitamin B-free diets and of the water intake and urine analyses of rats on diets deprived of vitamin B or vitamin G.

The vitamin B_1 and B_2 (G) content of South Dakota lamb (muscle, heart, kidney, liver, tongue, brain, and pancreas), E. PIERSON (*South Dakota Sta. Rpt. 1936, p. 29*).—Further progress is reported on the investigation noted previously (E. S. R., 75, p. 728).

The water-soluble B-vitamins.—VI, Flavin and vitamin B_6 in cereals, A. M. COPPING (*Biochem. Jour., 30 (1936), No. 5, pp. 849–856*).—In continuation of the study noted previously (E. S. R., 76, p. 426), the author investigated the dietary factors present in 80-percent alcoholic extracts of whole wheat and corn and milled cereal products prepared according to the Bourquin-Sherman method (E. S. R., 66, p. 410), and the relative amounts of the two components of vitamin B_2 present in the cereals.

An initial experiment demonstrated that the alcoholic extract of whole wheat contained a fair amount of vitamin B_6 but was deficient in flavine, since the animals receiving the whole wheat extract in the experimental diets composed of casein 18 percent, salt mixture 4, hardened cottonseed oil 8, lard 2, cornstarch 49 and 12, respectively, and cornstarch plus cereal extract 19 and 56 percent, respectively, after from 3 to 5 weeks, showed a severe degree of the "*b*" type of generalized skin affection, and the addition of vitamin B_6 prepared according to the method of Chick et al. did not alleviate the symptoms or restore growth until flavine was given. Twelve γ of hepaflavine daily for 4 weeks were sufficient to heal the skin lesions and restore growth. Further experiments with young rats placed at weaning time on diets containing extracts of whole wheat and corn and milled cereal products demonstrated that the wheat extract at higher levels of intake, supplemented by flavine, appeared to be better in growth-promoting effect than the corn extract. The extracts from milled cereal products when supplemented with flavine produced a much lower growth response in proportion to the intake than the extracts from whole cereals. It must, therefore, be concluded that a considerable portion of the vitamin B_6 is lost in milling and is, therefore, situated in the germ and integuments.

Diets containing 50 percent whole wheat or corn were fed to young rats and the results, judged by weight increases, indicated the presence of the whole vitamin B_2 complex in whole wheat but a lack of the flavine component in whole corn. The results of tests with white flour showed that the alcoholic extract contained only from one-third to one-fourth of the vitamin B_6 present in the flour. Another experiment, using diets containing 30 percent of whole wheat or corn, showed that the corn extract contained less vitamin B_6 than an equivalent amount of whole corn, and that less than one-third of the vitamin B_6 in whole wheat was removed by two extractions with cold 80-percent alcohol. Some of the experiments with corn and corn extracts suggest the possibility that a deleterious substance is present and may be extracted by cold 80-percent alcohol. The author states that more reliable results would be obtained by giving the test material as separate doses rather than using the Bourquin-Sherman type of diet because the variation in intake of food with the appetite of the experimental animals also causes variations in the intake of certain essential dietary factors and makes results more difficult of interpretation.

Electrocardiographic changes in rats deficient in vitamin B_1, P. M. ZOLL and S. WEISS (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 2, pp. 259–262, fig. 1*).—Rats on a diet sufficiently deficient in vitamin B_1 to cause marked loss in

weight, neurological manifestations, and bradycardia were used to obtain electrocardiograms before and after the subcutaneous administration of from 5γ to 25γ of crystalline vitamin B_1 (Merck).

During a period of 3 weeks on the markedly deficient diet the heart rate of the 9 rats under experiment gradually fell from a range of 504 to 666 (with an average of 581) beats per minute to from 354 to 134 (with an average of 286 beats per minute). In 5 of the rats the electrocardiograms showed T-wave changes of high origin but not uniform. In certain cases increases and in others decreases were observed. Both the bradycardia and the changes in the electrocardiographic complexes were abolished following the administration of crystalline vitamin B_1 when the heart rate had not fallen below 300. This was equally true if the animals were kept in a fasting state during treatment, thus indicating that the cardiac changes are directly related to vitamin B_1 deficiency rather than to malnutrition, although it is thought that the latter may play a secondary role.

The results reported are pointed out as in harmony with the electrocardiographic changes observed in human deficiency states, such as pellagra, polyneuritis, and beriberi. The essential difference is thought to be the presence of tachycardia in man rather than bradycardia in deficiency states attributed to vitamin B.

Avitaminosis.—XVIII, Peripheral nerves in vitamin B_1 deficiency as observed by polarized light, J. Lee and B. Sure (*Soc. Expt. Biol. and Med. Proc., 35 (1937), No. 4, pp. 583, 584*).—In this continuation of the previously noted series of papers from the Arkansas Experiment Station (E. S. R., 75, p. 426), a preliminary report is given of the application to the study of nerve degeneration in vitamin B_1 deficiency of the polarized light technic of Sutton, Setterfield, and Krauss (E. S. R., 73, p. 134).

Particular attention was paid to checking the dependability of the formalin fixation previous to the use of the polarized light. No differences could be observed between the results obtained with nerves fixed in 95 percent alcohol in liquid air and dehydrated in vacuo at −32° C. and those fixed in 10 percent formalin. The preparations studied included small pieces of spinal cord, trigeminal, sciatic, and optic nerves from rats on diets deficient only in vitamin B_1 and with varying degrees of polyneuritis and others on diets deficient in the vitamin B complex. The most regular and marked myelin degeneration was found in the sciatic and trigeminal nerves. A slight degeneration of the spinal cord was noted in 50 percent of the vitamin-deficient animals, but no changes could be observed in the optic nerves in any of the animals. It is noted that the extent of loss of weight in the experimental animals had no direct relationship to the severity of nerve degeneration, and that the nerve degeneration was observed in animals that did not develop paralysis on the vitamin B complex-deficient diet.

Attempts at vitamin C therapy in experimental poliomyelitis, C. W. Jungeblut (*Jour. Bact., 31 (1936), No. 1, pp. 34, 35*).—Previous work having shown that exceedingly small amounts of vitamin C are capable of inactivating the virus of poliomyelitis in vitro, the study was extended to in vivo experiments on monkeys.

Four groups of monkeys were infected with a uniform dose of 0.1 cc of a 10-percent virus suspension intracerebrally. Three of the groups were given varied doses of vitamin C daily by subcutaneous injection, beginning with the day of infection and continuing for a period of 2½ weeks. The 4 animals receiving the smallest dose, 5 mg, survived wthout showing any symptoms of poliomyelitis. Of 16 animals receiving from 10 to 50 mg, 2 survived without paralysis, 3 developed atypical poliomyelitis after a greatly prolonged incubation period, and

the remainder developed typical paralysis. All of the 9 animals which received the maximal doses (70 to 100 mg) and the 10 controls showed typical poliomyelitis. "Although it is premature to draw any definite conclusions from this preliminary report, there seems to be a strong probability that vitamin C when injected in the proper dose possesses distinct therapeutic power in experimental poliomyelitis."

Vitamin C therapy and prophylaxis in experimental poliomyelitis, C. W. JUNGEBLUT (*Jour. Expt. Med.*, *65* (*1937*), *No. 1*, *pp. 127–146*).—In continuation of the studies noted above, the author presents experimental data obtained from observations on 3 groups of monkeys treated with vitamin C before and after intracerebral infection with 0.1, 0.05, and 0.01 cc, respectively, of a 10-percent virus suspension of poliomyelitis virus. Following injection, daily quantities of vitamin C varying from 5 to 700 mg in group 1, from 5 to 25 mg in group 2, and from 5 to 100 mg in group 3 were injected over a 2-week period. Six of the 34 monkeys in group 1, 1 of the 6 in group 2, and 12 of the 22 in group 3 survived without paralysis. Only 2 of 38 untreated control animals failed to develop paralysis. Large doses of vitamin C were not beneficial, since all of the 10 monkeys receiving from 100 to 700 mg of the vitamin developed paralysis.

The prophylactic administration of from 25 to 500 mg of vitamin C to 26 monkeys for a period of from 1 to 2 weeks before injection of the virus was without any significant effect, and only 2 animals survived without paralysis. Only 1 of the 15 untreated control animals escaped the disease. It is suggested that vitamin C represents one of the deficiency factors in the susceptibility of humans to poliomyelitis.

The role of vitamin C in animals resistant to scurvy: Effects of insulin and adrenaline, K. M. DAOUD and M. A. S. EL AYYADI (*Biochem. Jour.*, *30* (*1936*), *No. 8*, *pp. 1280–1292*, *figs. 2*).—Male rats were placed on a scurvy-producing diet of Hassan and Basili (E. S. R., 69, p. 904) for periods varying from 3 to 90 days, while the control animals were fed an ordinary mixed diet. The Emmerie modification (E. S. R., 73, p. 583) of the methods of Birch and of Tillmans was applied for the estimation of vitamin C in the organs and in the urine.

The rate of urinary excretion of vitamin C in rats was decreased by a scorbutic diet or the injection of adrenaline and was increased by 24-hr. starvation. The vitamin C content of the adrenals was not altered by the scorbutic diet, 24-hr. starvation, or the injection of insulin or adrenaline. The vitamin C content of the liver was increased by the injection of insulin in the rats on the scorbutic diet but not by adrenaline. The amount of vitamin C excreted in the urine was lowered by adrenaline. The rate of glycogenolysis caused by adrenaline appears to run parallel with the degree of saturation of the body with vitamin C. It is suggested that this degree of saturation is a direct factor in determining the rate of glycogenolysis, or that vitamin C in the reduced form protects the adrenaline from rapid oxidation. The synthesis of vitamin C by rats on a scorbutic diet may be sufficient to insure freedom from scurvy while producing a relatively lower saturation of the body than when a diet containing the vitamin is fed.

The subscurvy state in relation to gastric and duodenal ulcer, H. E. ARCHER and G. GRAHAM (*Lancet* [*London*], *1936*, *II*, *No. 7*, *pp. 364–366*).—Continuing their observations on ascorbic acid excretion (E. S. R., 76, p. 135), the authors established the degree of saturation of ascorbic acid over a 6-day period in 9 male patients with gastric or duodenal ulcers. The patients were receiving a modification of the Lenhartz diet, which consists of unboiled milk, dried milk food, eggs, biscuits, and butter and contains negligible to small amounts of

vitamin C. In 8 cases 2 oz. of orange juice were added to the diet to bring the vitamin C intake up to approximately 40 mg.

Two healthy men, who served as controls, showed a slight degree of unsaturation of ascorbic acid. Three of the patients were in about the same condition as the control subjects. Of the remaining cases, 5 showed a grave degree of unsaturation, with the percentage excretion from the 400-mg test dose on the third day varying between 44 and 28.5 percent, while more satisfactory results were obtained on the sixth day, when the lowest percentage output was 77.7 percent. One case failed to show any response after a 2,400-mg intake, but on the sixth day excreted 77.7 percent after the ingestion of 400 mg of ascorbic acid.

The evidence that 6 out of 9 patients with gastric and duodenal ulcers are in the "subscurvy" state would suggest that the extremely low vitamin C diet prescribed in such conditions should be fortified with additional vitamin C in the form of 2 oz. daily of orange juice, supplying about 36 mg of ascorbic acid, in addition to a dose of 1,000 mg on 3 successive days to insure that the body is saturated.

Cevitamic acid excretion in pneumonias and some other pathological conditions, J. G. M. Bullowa, I. A. Rothstein, H. D. Ratish, and E. Harde (*Soc. Expt. Biol. and Med. Proc., 34 (1936), No. 1, pp. 1–7, fig. 1*).—In continuation of work noted (E. S. R., 74, p. 137), the urinary vitamin C excretion was followed in additional cases of pneumonia and in other pathological conditions before and after the administration of cevitamic acid in doses varying from 100 mg to 1 g, depending upon the age and vitamin excretion of the patient.

"The urinary titration of cevitamic acid has confirmed previous work with tissues of experimental animals, namely, the diminution of vitamin C in the course of many intoxications and pathological conditions. These states do not suggest scurvy, and may be designated hypovitaminosis accompanying, or etiologically related to, the pathological conditions with which they occur."

In the pneumonias studied no striking correlation could be drawn between the clinical condition and vitamin C excretion, except that in the greater number of cases a high temperature was accompanied by low excretion and that saturation often accompanied a drop of temperature. This supports the contention of Harris that increased metabolism is associated with increased destruction of the vitamin in the tissue.

Studies upon the mode of action of vitamin D.—I, Investigations upon the phosphorus compounds in muscles, liver, and kidneys as influenced by different levels of vitamin D and phosphorus in the diet, R. Nicolaysen (*Biochem. Jour., 30 (1936), No. 8, pp. 1329–1337*).—Groups of rats were placed on the Steenbock-Black rachitogenic diet (calcium: phosphorus ratio 4:7) and a phosphorus-rich diet (calcium: phosphorus ratio 0:7) with and without vitamin D (50 international units of calciferol daily). One group received the first diet supplemented by 100,000 international units of vitamin D daily over a period of from 10 to 14 days. A group of rachitic rats was given massive doses of vitamin D for varying periods prior to being killed.

In the rachitic rats the values for inorganic phosphorus + phosphagen of muscle and for inorganic phosphorus of liver and kidney were found to be less than for the rats receiving the same diet supplemented by vitamin D. The lipin phosphorus and protein phosphorus in the liver and kidneys, but not in the muscle, of the rachitic rats were similarly reduced. No definite change was observed in the readily or difficultly hydrolyzable esters in muscle or liver or the difficultly hydrolyzable esters in the kidneys. The animals on the phosphorus-rich diet remained normal and gave phosphorus compound values similar to those obtained from animals on the rachitic diet receiving the vitamin

D supplement. Improved calcification resulted when vitamin D was added to the phosphorus-rich diet, but the amount of phosphorus compounds in muscle, liver, and kidneys was unchanged. The administration to the rachitic rats of massive doses of vitamin D for short periods increased the inorganic phosphorus content to the normal level in muscle, liver, and kidneys, and when given for 2 weeks resulted only in an increase of inorganic phosphorus in the kidneys up to double the normal content. "There appears to be no evidence to support the view that vitamin D acts by maintaining a balance between the different forms of phosphorus in the organism."

Relationship shown between capillary resistance and dental caries (*Utah Sta. Bul. 276 (1936), pp. 70, 71*).—In this progress report a summary is given of studies by A. P. Brown on the capillary fragility, as determined by both Dalldorf and Göthlin technics, of groups of rural school children in the spring and fall and of college women students.

TEXTILES AND CLOTHING

Wool shrinkage (*Wyoming Sta. Rpt. 1936, p. 16*).—Comparisons of large and small samples of wool for shrinkage are briefly noted.

The influence of various kinds of wool on some of the physical properties of flannel, E. Pierson (*South Dakota Sta. Rpt. 1936, pp. 28, 29*).—In this progress report (E. S. R., 75, p. 734), the relative order for diameter and length of fibers is given for wool from the five breeds of sheep studied—Hampshire, Rambouillet, Shropshire, Southdown, and Tailless, and a few findings are reported as to the effect of dry cleaning on flannel woven from these wools.

Usage of household textiles by farm families, M. E. Frayser (*South Carolina Sta. Rpt. 1936, pp. 16–18*).—A summary is given of a survey of the quantities, kinds, and costs of textile materials used for household purposes by 297 white and 294 negro families in eight counties of the State.

HOME MANAGEMENT AND EQUIPMENT

Homemakers contribute to family income (*Oklahoma Sta. [Bien.] Rpt. 1935–36, pp. 164–169*).—A brief summary by G. Fernandes, L. Conner, and M. F. McCollum is given of the analysis of records of the contributions to family income of the homemakers on 163 wheat, cotton, and diversified farms in the State for 1 yr. during the period 1930–34. The summary includes tabulated data on the enterprises engaged in by these homemakers classified by type of enterprise and type of farm, and on the range in money value of these contributions.

A study of selected types of domestic gas stoves, A. E. Baragar (*Nebraska Sta. Res. Bul. 86 (1936), pp. 74, figs. 33*).—Seven domestic gas stoves, representing several types of surface burners, burner assemblies, and oven construction, were operated on natural gas of an average heat content of 1,009 B. t. u. per cubic foot, average sp. gr. 0.72, and a normal pressure of 7 in. of water. Six types of surface burners were tested, including the star, cast iron round, die-cast round, Y-, daisy, and continuous or ribbon flame types. These are described and illustrated by photographs, with types of utensils used.

In the surface burner performance tests, the technics for all of which are described, the thermal efficiency was found to depend upon the size and kind of utensil, the construction of the burner, and the type of stove top and grate construction, and to be independent of the quantity of water used, the length of the injector tube, and the gas rate if other factors were kept unchanged. Efficiencies determined by long-time tests in which water was actually boiled were found to be comparable with the average efficiencies for short-time tests

in which the water was heated from an initial temperature of 75° F. to a final temperature of 200°. The time of heating was found to be a function of the gas rate and the efficiency of the burner. However, the *gas rate should not be so high as to produce carbon monoxide*. The distribution of heat from the burner, as determined by the scorch-pattern method, was found to be a function of the utensil as well as the shape of the burner. Automatic lighters were not uniformly satisfactory or dependable. Boilover tests with either soap or starch solution revealed features of construction of burners and lighters that might otherwise have been missed, such as differences in ease of cleaning burner and cooking top.

From the technical data obtained concerning the performance of the surface burners of the types studied, it is thought that the performance of similar types of burners can be predicted. The heat distribution tests, automatic lighter tests, and boilover tests can be made by anyone. "If these tests are performed and then the efficiency judged on the basis of known data, a fairly comprehensive idea of what a particular burner will do may be obtained."

The oven tests included calibration of thermostat, determination of oven heat capacity, rate of cooling from an initial temperature of 550°, empty oven heat loss, surface temperature and internal heat distribution, open door heat loss, and analysis of the flue gas. The data obtained in these tests showed that it is impossible to predict the performance of an oven in terms of known factors from other ovens. The assumption that actual oven temperatures will agree with the dial setting was invalid at the 400° mark for four of the seven ovens tested. After adjustment of the thermostat so that the dial setting of 400° agreed with the actual oven temperature, temperatures as low as 300° were obtainable with only two of the ovens. Whenever low temperatures could not be obtained, the fault was usually in the burner design rather than in the thermostat. Changes in the burner design of two of the ovens made it possible to produce the low temperature readings. All of the ovens met the requirement of the American Gas Association for oven heating capacity. The heat loss data showed that, although all of the ovens were insulated, much heat was lost, chiefly by losses through the flue and through poorly fitting doors. The surface temperatures were low and the heat distributions within the ovens quite uniform.

Actual cooking tests, both on surface burners and in the ovens, to determine the amount of heat required and variations in the finished products gave results which in general confirmed the technical tests.

Additional information on the laboratory in which the work was done and its equipment, the technic for meter calibration, the construction and operation of a test box for testing surface burners, and data on the effect of temperature on gas rate for type A burners are given in a series of appendixes.

Kerosene cook stoves, M. M. Monroe and P. S. Greene (*Maine Sta. Bul. 384 (1936), pp. 406, 407*).—This preliminary report on a study of the economical management of kerosene cook stoves in Maine farm households to secure palatability of the product deals with the objectionable features for top-of-stove cooking of present burner designs.

MISCELLANEOUS

***List of publications of the United States Department of Agriculture* from January 1931 to December 1935, inclusive**, compiled by M. G. Hunt (*U. S. Dept. Agr., Misc. Pub. 252 (1936), pp. II+64*).—This supplements the list previously noted (E. S. R., 68, p. 874).

Annual Report [of Florida Station], 1936, W. Newell et al. (*Florida Sta. Rpt. 1936, pp. 161+IX, figs. 12*).—The experimental work not previously

referred to is for the most part abstracted elsewhere in this issue. Meteorological observations in the Everglades (pp. 115–117) and at the North Florida Substation at Quincy (p. 142) are also included.

Sixteenth Annual Report [of the Georgia Coastal Plain Station], 1936, S. H. STARR (*Georgia Coastal Plain Sta. Bul. 26 (1936), pp. 106, figs. 10*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data are also included.

Report of progress [of Maine Station] for year ending June 30, 1936, [F. GRIFFEE ET AL.] (*Maine Sta. Bul. 384 (1936), pp. 389–443, figs. 6*).—This bulletin contains data noted for the most part elsewhere in this issue or previously, together with meteorological investigations.

Science serving agriculture: Report of Oklahoma A. & M. College Agricultural Experiment Station, 1934–1936, C. P. BLACKWELL ET AL. (*Oklahoma Sta. [Bien.] Rpt. 1935–36, pp. 191, figs. 24*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological observations at Stillwater are also included.

Forty-ninth Annual Report of the Pennsylvania Agricultural Experiment Station, [1936], [R. L. WATTS ET AL.] (*Pennsylvania Sta. Bul. 336 (1936), pp. 46, figs. 7*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data (pp. 43–45) are also included, and data regarding the following: Influence of Electrolytes Added to Growth Medium on Electrophoretic Potential of *Escherichia coli*, by G. W. Pearce, M. W. Lisse, and R. P. Tittsler (pp. 14, 15); The Effect of Electrolytes Present in the Growth Media Upon the Electrophoretic Mobility of *Escherichia coli*, by J. T. Pedlow and M. W. Lisse (p. 15); The Effect of Certain X-Rays on the Electrophoretic Mobility of *Escherichia coli*, by M. E. Smith, M. W. Lisse, and W. P. Davey (p. 15); The Marketing of Milk, by F. F. Lininger and T. K. Cowden (pp. 16, 17); Rural Tax Delinquency in Pennsylvania, 1928–1932, by P. I. Wrigley (p. 17); and Produce Marketing in Reading and Wilkes-Barre, Pennsylvania, by R. B. Donaldson and J. Gauss (p. 17).

Report of Puerto Rico Experiment Station, 1935 [trans. title], [A. LEE] (*Puerto Rico Sta. Rpt. 1935, Span. ed., pp. [2]+36, figs. 15*).—A Spanish edition of this report (E. S. R., 75, p. 893).

Forty-ninth Annual Report of the South Carolina Experiment Station, [1936], H. P. COOPER ET AL. (*South Carolina Sta. Rpt. 1936, pp. 144, figs. 30*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Annual Report of the South Dakota Agricultural Experiment Station, [1936], J. W. WILSON ET AL. (*South Dakota Sta. Rpt. 1936, pp. 50*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

How science aids Utah agriculture: Biennial Report of the [Utah Station, 1935–36], L. NELSON (*Utah Sta. Bul. 276 (1936), pp. 84, figs. 37*).—The experimental work reported is for the most part noted elsewhere in this issue.

Forty-sixth Annual Report of [Wyoming Station, 1936], J. A. HILL (*Wyoming Sta. Rpt. 1936, pp. 38*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data are also included.

Progress report of the State experiment farms, W. L. QUAYLE (*Wyoming Sta. Bul. 219 (1937), pp. 47, figs. 7*).—The experimental work not previously abstracted is for the most part noted elsewhere in this issue.

NOTES

Arizona University and Station.—Dr. P. S. Burgess has resigned as president to return to his former position as dean of the College of Agriculture and director of the station. He will be succeeded, probably in September, by President Alfred Atkinson of the Montana College.

California University and Station.—Knowles A. Ryerson, in charge of citrus, avocado, and other subtropical fruit investigations of the U. S. D. A. Bureau of Plant Industry, has been appointed director of the branch of the College of Agriculture at Davis, vice Dr. W. L. Howard who will continue as professor of pomology and pomologist.

Indiana Station.—The board of trustees has approved the preparation of plans for a $175,000 addition to the horticultural building, and an agricultural chemistry building to cost $145,000. A new barn has also been approved for the dairy farm. Dr. J. L. Roberts has been appointed soil bacteriologist, effective July 1.

Kentucky Station.—The resignations are noted of Dr. W. T. Forsee as assistant chemist, D. E. Bayless as assistant in farm management, and L. V. Amburgey as microscopist in feed control. Ruth McDonald has been appointed technician in the department of animal pathology.

Mississippi College and Station.—Charles T. Ames, assistant director in charge of the Holly Springs Substation since 1906, died April 18 at the age of 68 years. A native of Mississippi, he was graduated from the college in 1890 and associated for about 5 years with its horticultural work. His service at Holly Springs began soon after the establishment of the station, and he was personally responsible for much of its subsequent upbuiding and development.

North Dakota Station.—Dorothy G. Berrigan, assistant in home economics research, resigned April 1. Harold Mattson has been appointed assistant horticulturist, effective May 1, and will be engaged in breeding and other investigations relating to potatoes.

Ohio State University.—President George W. Rightmire has been elected head of the recently established Research Foundation and Hurlbut S. Jacoby, university director of industrial research, as secretary and director. The foundation has a membership of 55, among them the director of the Ohio Station and representatives of the university faculty and alumni and of national industries.

Pennsylvania College and Station.—A new greenhouse, 30 by 150 ft., is to be built for research in horticulture. The greenhouse will be divided into four sections, the two larger ones for research with potatoes and roses and the two smaller ones for vegetable crop investigation.

Robert V. Boucher has succeeded Dr. J. E. Hunter, resigned, in the department of agricultural and biological chemistry.

Clemson College.—A new agricultural building has been completed at a cost of approximately $400,000, and has been named Long Agricultural Hall in honor of the late Dr. W. W. Long, for many years director of extension. It houses most of the school of agriculture, experiment station, and extension activities, providing office, classroom, and laboratory facilities which have been much needed.

Dedicatory exercises were held May 12, with Dr. Chester C. Davis of the Board of Governors, Federal Reserve System, as the principal speaker and his subject Education and Democracy. The honorary degree of D. Sc. was conferred upon Dr. Davis and 41 others, including from the U. S. Department of Agriculture, Assistant Secretary Harry L. Brown; Dr. J. T. Jardine, Director of Research and Chief of the Office of Experiment Stations; C. A. Cobb and Ivy W. Duggan, Agricultural Adjustment Administration; Dr. R. W. Webb, Bureau of Agricultural Economics; Dr. Henry D. Barker, H. W. Barre, Dr. W. W. Garner, and Dr. W. D. Moore, Bureau of Plant Industry; Dr. Thomas S. Buie and Tandy R. Reid, Resettlement Administration; and Dr. H. H. Bennett and M. L. Nichols, Soil Conservation Service; from the U. S. Farm Credit Administration, Dr. A. F. Lever; from the Tennessee Valley Authority, Dr. J. H. A. Morgan; experiment station directors M. J. Funchess of Alabama, D. T. Gray of Arkansas, Wilmon Newell of Florida, H. P. Stuckey of Georgia, T. P. Cooper of Kentucky, R. Y. Winters of North Carolina, and H. H. Zimmerley of Virginia (Truck); extension directors I. O. Schaub of North Carolina, C. E. Brehm of Tennessee, and J. R. Hutcheson of Virginia; Dr. E. W. Garris and H. H. Hume of the University of Florida; Dean Paul W. Chapman and J. A. Evans of the Georgia College; Dr. J. S. McHargue of the Kentucky University and Station; Dr. G. W. Keitt of the University of Wisconsin; Dr. R. F. Poole of the North Carolina Station; Dr. W. H. MacIntire and L. R. Neel of the Tennessee Station; T. B. Hutcheson of the Virginia Station; Dr. R. E. Remington of the Medical College of South Carolina; Dr. Wilson Gee of the University of Virginia; George E. Freeman, State Supervisor of Vocational Agriculture of Tennessee; Dr. Clarence Poe, Editor of *The Progressive Farmer and Southern Ruralist*; and Dr. D. R. Coker and George Wilds, Jr., of Coker's Pedigreed Seed Company.

U. S. Department of Agriculture.—Under a memorandum of April 9, 1937, an Advisory Committee on Research has been set up by Secretary Henry A. Wallace, consisting of F. D. Richey, H. G. Knight, J. R. Mohler, and L. A. Strong, chiefs, respectively, of the Bureau of Plant Industry, Bureau of Chemistry and Soils, Bureau of Animal Industry, and Bureau of Entomology and Plant Quarantine, and E. N. Bressman of the Agricultural Adjustment Administration. This committee will advise the Secretary and Director of Research on such specific research problems as may be assigned them from time to time. It will also, upon its own initiative, survey the field of research within the Department with a view to developing uniform research project systems and obtaining an able research personnel.

The appointment by transfer from the Soil Conservation Service of Merrill Bernard, hydraulic engineer, to succeed M. W. Hayes, deceased, as chief of the River and Flood Division of the Weather Bureau marks a new departure of the Bureau, namely, the selection of a hydrologist rather than a meteorologist to head one of its important divisions. The severe floods of the last few years have shown the need of hydrologic specialists in the task of developing new flood-forecasting methods, preparing and keeping current systems for the prompt collection of rainfall and river stage data, and determining the requirements for flood forecasts in overflow valleys.

Association of Land-Grant Colleges and Universities.—The fifty-first annual convention of this association will be held in Washington, D. C., from November 14 to 17, 1937. A part of the convention period will be devoted to the observance of the seventy-fifth anniversaries of the Morrill Act and the act establishing the U. S. Department of Agriculture and the fiftieth anniversary of the Hatch Act.

EXPERIMENT STATION RECORD

Vol. 77 | August, 1937 | No. 2

PERSONNEL CHANGES IN THE EXPERIMENT STATIONS

During the calendar year 1936 there was a net increase in the total station personnel of about 200, raising the total staff to approximately 4,000. Fully 52 percent of these are reported as full-time workers. About 77 percent of the total number have received advanced degrees.

These findings are based on an analysis of the publication prepared in the Office of Experiment Stations entitled Workers in Subjects Pertaining to Agriculture in Land-Grant Colleges and Experiment Stations (E. S. R., 77, p. 128). This publication is intended primarily as a directory, but considerable additional information is derivable from its pages if desired. Some variations in the method of compilation occur from year to year, but of late these have been of little significance for statistical purposes and a number of comparisons and deductions may be attempted with an expectation of at least approximate accuracy.

Using as a basis the last two of these reports, issued in March 1936 and 1937 and covering in a general way conditions up to about February 1 of their respective years, it appears that about 3,200 names are recorded for substantially the same positions in the 2 years; that about 150 names were connected with the same stations but with advancement to higher positions; and that about 600 names were new to the stations from which they were reported. The net increase in station enrollment for the later year was about 200, so that in many cases what has doubtless occurred has been a transfer from one station to another.

Because of divided duties, the total manpower of the stations is much less than the aggregate of individuals. The count shows 52 percent of the employees enrolled as full time, but affords no basis for estimating the proportion given to station work by the 48 percent also engaged in teaching, extension, and/or other nonstation work. Comparison is possible, however, with the findings in a similar survey reported in these columns in 1921 (E. S. R., 44, p. 301). At that time fully 60 percent of the station staff had additional duties, a substantial increase from the 43 percent so reported in 1911. It would therefore

appear that the drift toward part-time workers, regarded as unfortunate in the discussion of 16 years ago, has now ceased. Further analysis shows that the majority of the full-time employees are in the assistant and similar grades, perhaps justifying the conclusion that at least the routine of station research is increasingly being organized on a full-time basis.

A survey of the situation as regards advanced degrees reveals that in 1935 approximately 38 percent of the stations' staff had earned doctors' degrees, while for 40 percent of the entire number the master's degree was their highest. In 1936 these proportions were 40 and 37 percent. While nearly 100 more individuals were reported with only the bachelor's degree in 1936, this increase is probably largely the result of the greater number of assistants made possible by increased funds, and it is reasonable to assume that many of these assistants are already taking graduate work. Much more significant is the increase of over 100 in the number of earned doctorates. The survey in 1921 revealed only 48 percent of the staff with advanced degrees, and in 1911 there were only 32 percent. At that time, it was said, "a relatively small fraction of the degrees were beyond that of the master's; only 8½ percent of the whole force in 1911 and 15 percent of the present force had taken the doctor's degree. This increase in the proportion of workers having second degrees is gratifying as showing a considerably higher academic standard than 10 years ago, but considering the expert nature of the stations' activities, the fact that less than a third of the whole staff then and less than half now have gone beyond the bachelor courses points to a situation which is likely to prove a handicap in original inquiry." Today this situation seems to have been considerably ameliorated.

Further analysis of the material at hand would doubtless disclose additional details of interest, and it would seem that there is an opportunity for more intensive personnel studies which might prove enlightening and of considerable practical value. The points brought out in the present cursory discussion indicate that progress is being made in meeting some of the problems of earlier years. This is cause *for congratulation.*

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Principles of biochemistry, A. P. MATHEWS (*Baltimore: William Wood & Co., 1936, pp. X+512, [pls. 5]*).—In this textbook for medical students the subject matter is divided into six parts: The chemistry and metabolism of the glucides, of the lipids, and of the proteins, the special chemistry of the blood and connective tissues, the catalytic agents of growth and development—vitamins and hormones, and the income of energy. Since this is not intended to be a reference handbook, almost all references to the literature have been omitted.

[**Chemical investigations of the Delaware Station**] (*Delaware Sta. Bul. 205 (1936), p. 23*).—This presents concise summaries of work on enzymatic hydrolysis of starch in pectic extractions from apple pomace and the extraction of phospholipoids from the soybean oil meal, both by A. A. Horvath.

[**Chemical investigations of the Iowa Station**] (*Iowa Sta. Rpt. 1936, pt. 2, pp. 55–58*).—Progress notes are given on certain chemical and physical characteristics of corn as these relate to industrial utilization, by R. M. Hixon; identification of the water-soluble and the acid hydrolyzable carbohydrate constituents of the cornstalk, by W. G. Gaessler and Hixon; the physical properties of dextrose, by J. H. Buchanan; and fermentation products of xylan and utilization of agricultural products in the fermentative production of lactic acid, both by C. H. Werkman.

Preparation of gliadin and zein, L. S. NOLAN and H. B. VICKERY (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 3, pp. 449–451*).—The novel feature of these two methods, devised at the Connecticut [New Haven] Experiment Station, consists in the means adopted for securing a precipitation of the respective prolamines in a satisfactory physical condition.

Gliadin was extracted from wheat gluten flour by 70 percent alcohol at 55°–60° C, the solution was filtered clear through a thick paper-pulp mat, and it was concentrated, until the frothing became uncontrollable, under reduced pressure. To effect precipitation, "the clear concentrated alcoholic solution is placed in lots of about 1 l in a large enamelware tub, and water is violently squirted into the tub in such a manner as to cause the greatest possible agitation. Under these conditions, the gliadin separates from solution in the form of a highly aerated froth. This is skimmed off and, when all has been collected, is thoroughly beaten or whipped with a wire cream beater until homogeneous. The froth is then placed in a thin layer (3–5 cm) on pans and is rapidly dried in a current of warm air (70°–80°). After the froth has become somewhat dry on top, any water that has accumulated beneath it is poured off.

"The drying must be rapid in order to avoid a collapse of the froth. When correctly dried the product is a crisp, white, much expanded mass. It is crushed by hand and passed through a mill to reduce it to a light somewhat scaly powder."

Zein was extracted from corn gluten by hot (50°–60°) 80 percent alcohol and filtered in the manner already indicated. "The filtrate is treated in convenient portions with an equal volume of ether, and the precipitated protein is thoroughly stirred with the fluid which is finally poured off. This step removes most of the fat and pigment, and is less troublesome than the extraction with ethylene dichloride advocated by Mason and Palmer [E. S. R., 75, p. 582]. *Reprecipitation of an alcoholic solution of the protein with ether* may be carried out if a product of high purity is sought.

"The precipitated protein is dissolved in a small amount of warm 80 percent alcohol, and should form a perfectly clear although very thick and viscous solution. This is transferred to a separatory funnel with the aid of a little diluted alcohol, and the funnel is set up over the following device: A large sheet of cotton gauze (cheesecloth) is spread on a wire-mesh rack in a sink and on it is placed a shallow round pan (milk pan). Water from a hose which has been fitted with a glass nozzle constricted so as to deliver a rapid flat stream about 2 cm wide is directed into this pan. A very thin continuous stream of the zein solution is then allowed to fall from the separatory funnel upon this stream of water. The zein is partially precipitated at contact, and the process is completed in the violently agitated water in the pan. Most of the protein is washed out of the pan but is retained by the gauze. At the end of the operation it is collected in the gauze, thoroughly washed with water, and is finally allowed to remain in water overnight. It is then filtered on a Buchner funnel, spread in a thin layer on pans, and allowed to dry at room temperature. Before it becomes thoroughly dry, there is a point at which it can be easily rubbed through a fine sieve whereby a uniform product is obtained."

Dough structure and properties, C. H. Bailey (*Northwest. Miller, 188 (1936), No. 5, pp. 433, 434*).—The author presents, from the Minnesota Experiment Station, a condensed, semipopular discussion of the physics and chemistry of the formation of doughs and of their behavior during fermentation.

Biochemical methods for the study of nitrogen metabolism in plants, F. S. Orcutt and P. W. Wilson (*Plant Physiol., 11 (1936), No. 4, pp. 713–729, figs. 2*).—This contribution from the University of Wisconsin suggests a method of preparing plant sap for analysis "which eliminates the uncertainty of extraction and precipitation methods. Hydrolysis of amide nitrogen is accomplished without humin formation by hydrolyzing with 20 percent sodium bisulfite in a steamer for 3 hr. (Humin formation amounts to 12 to 15 percent of the soluble nitrogen in soybeans.) Hydrolysis of nitrogen compounds between proteins and amino acids by an enzyme solution containing proteinase, carboxypolypeptidase, aminopolypeptidase, and dipeptidase [extracted with water from the mycelial mass of cultures of *Aspergillus parasiticus* or of *A. wentii* after grinding] is also accomplished without humin formation. The error in phosphotungstic acid precipitation and 'other nitrogen' owing to the presence of peptides, etc., is eliminated by the hydrolysis procedure. Determination of alpha amino nitrogen before and after hydrolysis may be used as a more accurate method of determining peptide nitrogen than precipitation methods."

Two nitrogen fractionations of top and root sap of soybeans showing the difference in nitrogen distribution before and after hydrolysis, to illustrate the value of the proposed system of analysis, are given, and the suggested procedure for nitrogen fractionation in plant juice is outlined.

Lipase production by Penicillium oxalicum and Aspergillus flavus, D. Kirsh (*Jour. Tenn. Acad. Sci., 11 (1936), No. 4, pp. 250, 296*).—The author very

riefly notes experiments to determine optimal conditions for the production f lipase extractable from cultures from two of the organisms named. It is tated that "lipase precipitated from the *P. oxalicum* extract by means of lcohol contained 8½ times more of this enzyme per unit of protease than did commerial high lipase trypsin. The activity was low when obtained from arge cultures: the dry enzyme prepared from small lots of medium showed good activity."

On the mechanism of enzyme action: A study of the decomposition of monoethyl hydrogen peroxide by catalase and of an intermediate enzyme-substrate compound, K. G. Stern (*Jour. Biol. Chem., 114 (1936), No. 2, pp. 473–494, figs. 6*).—In an investigation of the decomposition of monoethyl hydrogen peroxide by liver catalase, a volumetric procedure was used for the assay of the peroxide. The kinetics and the effect of temperture, of pH, of varying the substrate concentration, and of cyanide on the enzyme reaction were studied. The results are compared with those obtained wth hydrogen peroxide as substrate.

"In the course of the enzymatic process there is formed an intermediate compound with a characteristic absorption spectrum. The intermediate is unstable; it breaks down to form free enzyme and reaction products. . . . A preliminary optical study of this compound has revealed that it is not a mere absorption complex; that the rate of formation of the enzyme-substrate compound is great compared with that of the total reaction; that it has a smaller temperature coefficient than the over-all reaction; that it is independent of pH between 4 and 9."

Formation of sulfide by some sulfur bacteria, R. L. Starkey (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 1, pp. 120–122*).—In an investigation reported from the New Jersey Experiment Stations, "lead acetate paper suspended over the culture solution containing elemental sulfur and inoculated with *Th[iobacillus] thiooxidans* showed slight darkening after growth for 10 days. The test for sulfide became increasingly stronger with longer growth. Cultures of *T. thioparus* growing on a thiosulfate medium produced slight darkening of the lead acetate paper in 4 days and within another week showed deep blackening. The test for sulfide was preceded many hours by the precipitation of sulfur in the medium, a transformation which characterizes growth of this bacterium on thiosulfate.

"There can be no question as to the production of sulfide by both bacteria, but there is no indication that any appreciable quantity persists in the medium. It seems most probable that the sulfide is formed in both cases by reduction of elemental sulfur. The reduction of elemental sulfur to sulfide is effected by compounds containing —SH groups in animal and plant tissues and by glutathione. The occurence of —SH groups has been established for a great variety of tissues and organisms, including many filamentous fungi and bacteria. In the present studies, cellular material of several organisms, including bacteria, fungi, and actinomycetes, has been found to form sulfide from elemental sulfur. It is concluded that formation of sulfide by the sulfur bacteria is evidence that these organisms also contain substances possessing active —SH groups."

Second report of the Organic Carbon Committee, E. M. Crowther (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 82, 83*).—This very brief report contains only additions and corrections to the first report, already noted (E. S. R., 76, p. 583).

A nomogram for the relation between the quinhydrone potential and pH at various temperatures, G. Knaysi (*Food Res., 1 (1936), No. 3, pp. 297–299, fig. 1*).—The chart constructed by the author of this contribution from the

[New York] Cornell Experiment Station is derived from the equation $pH=\frac{V+0.4529+0.00002\,t}{0.00019832\,T}$, in which V represents the voltage with respect to the saturated calomel electrode, t the centigrade temperature, and T the absolute temperature.

"By transforming the above relation to the form $T-\frac{V+0.447438}{0.00019832\,pH-0.00002}=0$, it reduced to the classical form $f_1f_3+f_2=0$ representable by a nomogram of three scales, two of which are supported by parallel axes."

Ten pH values, as read from the chart and as calculated, show a standard deviation of ±0.0158.

A rapid method for determining soil moisture, E. M. Emmert (*Soil Sci., 43 (1937), No. 1, pp. 31–36, fig. 1*).—A method reported from the Kentucky Experiment Station is described as being "based on the fact that when water is added to concentrated sulfuric acid, a definite amount of heat is produced, proportional, within certain limits, to the quantities of water and acid mixed. With a fixed quantity of acid, the rise in temperature of the mixture will be definitely related to the quantity of water added and may serve as a measure of that quantity. Because the specific heat of water is greater than that of sulfuric acid, the rise in temperature when different quantities of water are added to a fixed quantity of acid is not exactly proportional to the quantity added but diminishes somewhat as the quantity of water is increased. Thus a series of such temperature readings, with fixed quantity of acid and increased quantities of water, could be plotted into a curve which would tend to flatten out as the quantity of water was increased."

On the determination of available phosphoric acid in acid or neutral soils by means of citric acid [trans. title], V. Vincent (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 123–126*).—The author finds that for neutral or acid soils (but not for calcareous soils) the method of extracting with 2 percent citric acid solution, as here outlined, is adequate to show the quantities of phosphate in mineral form and immediately assimilable and to indicate the degree of importance of the organic combinations.

Absorption spectra in vitamin research [trans. title], H. Rudy (*Naturwissenschaften, 24 (1936), No. 32, pp. 497–505, figs. 6*).—The author reviews the chemical structures of vitamins A, B_1 (aneurin), B_2 (lactoflavine), C, D_2 (calciferol), and D_3 in relation to their characteristic spectroscopic absorptions.

A crystalline vitamin A concentrate, H. N. Holmes and R. E. Corbet (*Science, 85 (1937), No. 2195, p. 103*).—In this preliminary note it is announced that a vitamin A concentrate distinctly crystalline to the naked eye has been prepared from the nonsaponifiable matter of the Ishinagi liver oil (*Stereolepis ishinagi*) by solution in a suitable solvent and fractionation by freezing at a temperature of solid carbon dioxide. Certain physical and chemical constants for the concentrate are given, with tentative values for carbon and hydrogen content.

Spectrographic studies on the antimony trichloride reaction for vitamin A.—I, The relation between tintometer readings and spectral absorption of the blue solution, O. Notevarp and H. W. Weedon (*Biochem. Jour., 30 (1936), No. 9, pp. 1705–1718, figs. 14*).—A series of reactions with antimony trichloride reagent (concentration 220–225 g per liter of chromogenic substance) was carried out at 18°±0.5° C., including one set made in a partial vacuum at about 30°, on samples of pure cod-liver oil and concentrates. The solutions were examined in the tintometer to determine blue values, and spectrographic measurements were made with 5 sec. as the standard time of exposure.

The blue solutions of the oils and concentrates in amounts varying from 0.05 to 0.4 cc followed Beer's law. This finding was confirmed spectrographically, and it is concluded that this lack of proportionality between blue readings and the concentration is a purely physical phenomenon. "The blue value, as read in the tintometer, of a solution with a given absorption maximum is 40–50 percent higher when the band lies at 618 mμ than when it lies at 603 mμ. Even if the reaction were not inhibited by the oil, a concentrate should therefore always give a blue value nearly twice that of the corresponding oil if they are measured at the same reading."

A chemical reagent for the detection and estimation of vitamin B_1, H. J. PREBLUDA and E. V. McCOLLUM (*Science, 84 (1936), No. 2187, p. 488*).—In this preliminary note it is stated that when a solution of either *p*-amino acetanilid or methyl-*p*-amino phenyl ketone (*p*-amino acetophenone) is treated with nitrous acid and the product formed by the reaction is treated under certain conditions with vitamin B_1 a characteristic purple red compound is formed which is stable and highly insoluble in water. The colored compound may be extracted quantitatively with a suitable solvent. The test is said to be extremely sensitive, the reaction taking place with quantities as small as several millionths of a gram of the active material.

Vitamin C in vegetables.—III, The oxidation of ascorbic acid by metallic catalysts, G. L. MACK and Z. I. KERTESZ (*Food Res., 1 (1936), No. 4, pp. 377–382, fig. 1*).—This and the following paper from the New York State Experiment Station are in continuation of the series noted on page 280. The purpose was to determine the effect of traces of copper and iron occurring as impurities in the ordinary routine analysis on the determination of ascorbic acid in vegetables. A repetition with very pure materials of earlier work of Kellie and Zilva, which had led these authors to regard both iron and copper as catalysts for the oxidation, has led to the conclusion, confirming that of Barron et al. (E. S. R., 75, p. 741), that iron alone does not catalyze the oxidation, but that in the presence of iron copper exerts an increased catalytic action.

The addition of 2 percent of metaphosphoric acid to the acid used to extract the ascorbic acid from vegetables, as suggested by Fujita et al. (E. S. R., 76, p. 155), is recommended as an effective method to prevent any appreciable oxidation by copper in the time required for the analysis. The possibility that copper as contained in the vegetables might also exert a catalytic effect was tested by determining the ionizable or catalytically active copper in peas and snap beans. Only a small fraction of the total copper in peas and none of that present in snap beans appeared to be catalytically active.

It is emphasized that a reasonable amount of care should be exercised in the selection of reagents as free as possible from copper.

Vitamin C in vegetables.—IV, Ascorbic acid oxidase, Z. I. KERTESZ, R. B. DEARBORN, and G. L. MACK (*Jour. Biol. Chem., 116 (1936), No. 2, pp. 717–725, figs. 3*).—This paper reports experiments dealing with the thermal inactivation of the enzyme which oxidizes ascorbic acid into dehydroascorbic acid and the importance of this enzyme from the standpoint of nutrition and food preservation. The extent of heating needed for the inactivation of the ascorbic acid oxidase in vegetables was determined by grinding the vegetable with an equal weight of water, immersing 5 cc of the mixture in boiling water for a definite period of time, cooling, adding 1 cc of a solution containing 0.5 mg of ascorbic acid, and keeping the mixture at 30° C. for 3 hr. Changes in the ascorbic acid content of the mixture were followed by titration with the indophenol dye. The relative catalase activity of the samples was determined at pH 7 by the usual method of estimation of the residual hydrogen peroxide after 1 hr.

The ascorbic acid oxidase in all samples was completely inactivated in 1 min., but the loss caused by nonenzymic catalysis was considerable during the 3-hr. period. In spinach the enzymic catalysis of the oxidation was rather slow, only a fraction of that observed in the cabbage extract, but the nonenzymic catalysis was more rapid than in any other vegetable studied. In all of the vegetable extracts the inactivation of catalase showed good correlation with that of ascorbic acid oxidase. Similar results were obtained with whole peas heated for different lengths of time. Both the oxidase and the catalase were completely inactivated by 1 min. of heating and the oxidase alone by ½ min. of heating. In a further experiment with peas, vined (machine-shelled) Thomas Laxton peas were blanched in steam for 30, 60, 120, and 300 secs., quick-frozen, and stored at −7° for 2 mo., at the end of which time the ascorbic acid content of all the samples was determined chemically. The highest ascorbic acid value was in the sample which had been heated 1 min., the time found sufficient for complete inactivation of both ascorbic acid oxidase and catalase.

Inasmuch as ascorbic acid oxidase catalyzes the formation of dehydroascorbic acid, the question of the practical significance of the presence of this enzyme in plants is raised and answered by data showing the different stages in the decomposition of ascorbic acid in extracts of cabbage in the presence and absence of the oxidase. In the presence of the oxidase there is a rapid transformation of ascorbic acid into regenerable dehydroascorbic acid which, however, is slowly changed into a physiologically inactive substance, while in the presence of the enzyme the conversion of ascorbic acid into dehydroascorbic acid is very slow.

Some relations between ascorbic acid and glutathione, F. G. Hopkins and E. J. Morgan (*Biochem. Jour., 30 (1936), No. 8, pp. 1446–1462, figs. 13*).—The authors describe experiments which demonstrated the action of the ascorbic acid oxidase of cauliflower on ascorbic acid and reduced glutathione. The enzyme which rapidly oxidized ascorbic acid to dehydroascorbic acid caused the oxidation of reduced glutathione only in the presence of ascorbic acid. The glutathione was oxidized at the same rate as the ascorbic acid, but the oxidation of the ascorbic acid did not begin until the glutathione had practically disappeared from the system. The opinion of Szent-Györgyi that this action is due to continuous reduction of the dehydroascorbic acid formed is confirmed, since the dehydroascorbic acid in the presence of the oxidase and of reduced glutathione was reduced by the reduced glutathione at a much quicker rate than that at which ascorbic acid was oxidized by the oxidase.

The presence of glutathione also protected the ascorbic acid from oxidation by copper catalysis by forming a stable compound with the copper and so preventing efficient contacts between the metal and its substrate. From the results of experiments to determine the behavior of ascorbic acid and glutathione in aerated hepatic tissue, it would appear that normally the two substances are oxidized independently, perhaps by different agencies.

The enzyme is believed to be identical with the hexoxidase of cabbage described by A. Szent-Györgyi[1] and probably also with the similar enzyme of squash (*Curcubita maxima*) described by Tauber et al. (E. S. R., 74, p. 442).

Value of the acid silver nitrate reaction as a test of ascorbic acid, A. Giroud and C. P. Leblond (*Nature [London], 138 (1936), No. 3484, pp. 247, 248*).—Attention is called to the criticisms of the specificity of the silver nitrate reaction for ascorbic acid expressed by several investigators, including Harris

[1] Jour. Biol. Chem., 90 (1931), No. 1, pp. 385–393, figs. 3.

and Ray (E. S. R., 72, p. 731), Dann and Cowgill (E. S. R., 75, p. 285), and King (E. S. R., 75, p. 571). Evidence is summarized in support of the view that the reduction, without the action of heat and light, of silver nitrate acidified with acetic acid is a very specific test for ascorbic acid, but that a negative reaction does not necessarily mean the absence of ascorbic acid. The chief reason for the occasional failure of the test is thought to be the presence in the organs tested of factors inhibiting the reduction of ascorbic acid.

Observations on the use of the phosphotungstic acid method of determining ascorbic acid in urines with low ascorbic acid content, G. Medes (*Biochem. Jour., 30 (1936), No. 9, pp. 1753–1755*).—Referring to a previous study (E. S. R., 75, p. 744), the author presents special precautions that must be employed in using the phosphotungstic acid method on urines containing less than 4×10^{-4} g mol ascorbic acid per 100 cc. Color interference may be taken care of by introducing a few drops of an indicator such as bromophenol blue, using a color filter, or backing the standard by urine diluted similarly to that in the test solution. The faint cloudiness which frequently develops in urines extremely low in ascorbic acid may be removed by centrifuging. The colorimetric readings should be taken immediately at the close of the 20-min. period (20±5 min.).

In a series of tests on four urines of low ascorbic acid content the colorimetric method was compared with the titration method, and it was concluded that the two methods are about equally accurate when the ascorbic acid concentration in the urine is very low. The colorimetric method proved to be more accurate when the ascorbic acid concentration of the urine had been increased by the addition of increments of standardized ascorbic acid.

Energy equivalents of vitamin D units, R. W. Haman and H. Steenbock (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 4, pp. 291–293, fig. 1*).—In this study at the Wisconsin Experiment Station the authors have used a technic similar to that described by Marshall and Knudson (E. S. R., 64, p. 504) to determine the amounts of radiant energy required to synthesize 1 international unit and 1 Steenbock unit of vitamin D, using ergosterol as the substrate. The values obtained were 900 and 3,000 e, respectively, independent of the wavelengths within the synthesizing region. This ratio of 1:3.33 has been found to check with biological tests. One Steenbock unit of vitamin D is thus equivalent to 3.33 international units instead of 2.7 units as adopted provisionally.

Accuracy of certain methods used in analysis of sauerkraut, C. S. Pederson and C. D. Kelly (*Food Res., 1 (1936), No. 3, pp. 277–286, figs. 5*).—In an investigation carried out at the New York State Experiment Station, the authors have shown that salometer readings are so affected by the various ingredients in kraut juice, such as acid, sugar, suspended solids, alcohol, and proteins, that they are of little or no value for estimation of the salt content. Direct titration of the juice with silver nitrate, using potassium chromate as an indicator, was found sufficiently accurate for practical use, however. The salometer reading could be used as a fair indication of the total solids in kraut juice but not of salt alone.

"Absolute uniformity, particularly in regard to salt, is difficult to obtain in a vat of kraut. The salt of the juice in the well is usually higher than that in the center of the vat, although the salometer reading is nearly always lower. Weighing salt and shredded cabbage is apparently the only absolute method of establishing a definite salt content in kraut.

"The direct titration of acid in sauerkraut juice, using phenolphthalein as an indicator, gives results that are somewhat low, but they are comparable

and therefore valuable. Liberation of organic acids by mineral acids is essential to complete extraction and steam distillation of organic acids. Volatile acid determinations are somewhat variable and quite dependent upon the amount of extract collected."

Effect of processing and storage on composition and color of honey, E. G. LYNN, D. T. ENGLIS, and V. G. MILUM (*Food Res., 1 (1936), No. 3, pp. 255–261, fig. 1*).—At the University of Illinois, a sweetclover honey was extracted and strained, and separate lots were heated for 30 min. at 82.2°, 71.1°, and 62.8° C., respectively. Samples from each lot were placed in screw-top jars and stored at constant temperatures of 36.6°, 25°, and 4.4° for a year. They were then examined for certain chemical and physical changes.

"The moisture content decreased markedly with increase in storage temperature. Certain irregularities are probably due to variation in the tightness of the cap. Reducing sugars increased slightly with increase in storage temperature. The samples with the higher processing temperature showed the greater increase. The total nitrogen content of samples representing extremes of treatment showed no significant difference. The amino nitrogen decreased with increase in storage temperature, but the actual amount present at any time was small. Coloration, on the other hand, increased with increase in temperature. The samples stored at the higher temperature showed a marked increase in absorption for the light of shorter wavelengths of the visible spectrum and little change for the longer wavelengths. It is believed that darkening of the samples is due primarily to instability of the fructose of honey."

A note on the nitrogenous constituents of dried apricots during browning, C. L. BEDFORD (*Food Res., 1 (1936), No. 4, pp. 337–339*).—"From the data obtained . . . [at the University of California] it appears safe to conclude that the changes in the N fraction of the water-soluble material from apricots on darkening are slight, and it is doubtful that they or the sugars are involved in the darkening."

The brown pigment formed in the concentrated extract or in the dried fruit itself is water-soluble. Most of it is readily precipitated from concentrated aqueous solution by adding alcohol or acetone. It is also precipitated by lead acetate and is recoverable by deleading with hydrogen sulfide or diluted sulfuric acid, followed by precipitation with acetone. This precipitate is insoluble in ethyl ether, petroleum ether, benzol, and ethyl acetate. It contains about 1 percent of nitrogen.

"Whether the N represents a combination of a nitrogenous compound and some other compound of the fruit or is merely adsorbed N or some other form of uncombined N compound is yet to be determined."

Home fruit bottling (*Univ. Leeds and Yorkshire Council Agr. Ed. [Pam.] 184 (1936), pp. [4], fig. 1*).—This pamphlet gives brief information on the selection of fruit, types of bottles, the preparation of a home-made wax seal, and the packing and sterilizing of the fruit and sirup.

The cooking process.—IX, Pulping wood with alcohols and other organic reagents, S. I. ARONOVSKY and R. A. GORTNER (*Indus. and Engin. Chem., 28 (1936), No. 11, pp. 1270–1276, figs. 3*).—This contribution from the Minnesota Experiment Station reports experiments carried out under conditions very similar to those of earlier work (E. S. R., 74, p. 594) save that the cooking medium consisted of equal volumes of the organic solvent and distilled water. The solids glucose, mannitol, and urea were applied as aqueous solutions of various concentrations.

"The normal primary alcohols were better pulping agents than the secondary or tertiary alcohols. Normal butyl and amyl alcohols yielded better pulped residues than were obtained with the other alcohols. There appeared to be a definite relation between the aqueous solubilities of the monohydroxy alcohols and their pulping properties. The pulping efficiencies of the alcohols also seemed to be related to the zeta potentials at the cellulose-alcohol interfaces. Aspen chips cooked with normal butyl alcohol yielded a pulp which was comparable to the usual commercial aspen soda pulp in strength characteristics. Coniferous woods were not pulped by butyl alcohol as readily as the aspen. The residual liquors of the cooks made with normal butyl and amyl alcohols consisted of two layers—the top alcoholic layer contained the organic substances extracted from the wood and the lower aqueous layer contained only small quantities of water-soluble substances. This pulping procedure provides a means of obtaining the ligneous material of the wood uncontaminated by inorganic compounds not present in the original wood."

Some of the properties of the extracted ligneous material are stated.

AGRICULTURAL METEOROLOGY

Agricultural meteorology, L. A. RAMDAS and M. S. KATTI (*Indian Jour. Agr. Sci., 4 (1934), No. 6, pp. 923–937, figs. 4; 6 (1936), No. 6, pp. 1163–1200, pl. 1, figs. 10*).—In a study of soil moisture in relation to moisture in the surface layers of the atmosphere during a clear season, evidence was obtained that evaporation of moisture from a soil surface containing only hygroscopic water and the reverse phenomenon during night, viz, the absorption of moisture from the air layers near the ground by the desiccated soil surface, exert a controlling influence on the distribution of moisture with height in the air layers. Studies in laboratory and field of diurnal variation in the moisture content as determined by two-hourly measurements were made with representative soils from different parts of the country, the soils being under identical conditions in each case. These studies showed that "there is a conspicuous exchange of moisture between the soil surface and the air layers above it, the intensity of this exchange is a characteristic property of each soil, and the epochs of maximum and minimum moisture contents of the soil coincide with those of minimum and maximum temperatures respectively."

The results further showed that except for specific heat and true specific gravity the following properties of soils vary in a similar manner: "Diurnal variation of moisture, water-holding capacity, absorption of moisture in a definite time interval under steady laboratory conditions, and heat of wetting."

The determination of sodium chloride content of air, H. P. GODARD and W. F. SEYER (*Roy. Soc. Canada, Trans., 3. ser., 30 (1936), Sect. III, pp. 85–88, fig. 1; abs. in Sci. Abs., Sect. A—Phys., 40 (1937), No. 469, pp. 36, 37*).—By means of a method of filtering the air coming from all directions along the coast of Vancouver and determining its chloride content, there was found to be no correlation between wind direction and salt content, but cold clear days and days of high relative humidity showed a high salt content. A special apparatus for making observations over the sea or close to the sea is described.

A simple device for recording the time and duration of rainfall, R. R. HIRT (*Phytopathology, 26 (1936), No. 11, pp. 1064–1067, figs. 2*).—The device consists of a revolving disk actuated by the mechanical parts of a standard alarm clock, mounted in a wooden case. An opening in the cover permits drops of rain to fall on a circular record sheet attached to the revolving disk, the accuracy of the record being regulated by the size of the opening. Each record

sheet is divided by radial lines into 24 equal sectors, representing ½-hr. intervals, and concentric circles are drawn with indelible lead on these sheets. The time and duration of rainfall are recorded as colored spots or washed streaks. The device is useful in epidemiology studies where the time and duration of rainfall is a factor.

Evaporating power of the air and humidity of the soil [trans. title], H. GESLIN (*Compt. Rend. Acad. Sci.* [*Paris*], *203* (*1936*), *No. 21, pp. 1095–1097, fig. 1; abs. in Sci. Abs., Sect. A—Phys., 40* (*1937*), *No. 469, p. 87.*)—A comparison of observed and calculated evaporation from the soil is reported which showed that the calculated humidities corresponded well with the observed humidities, also, that a soil humidity of 25 percent on the scale adopted characterizes the capacity of the soil for retention of precipitation. By this means there is provided a simple method for knowing at each instant from ordinary climatological data the reserves of water in the soil and of determining fluctuations of these reserves with time.

Index characterizing the factor of drought in agronomy [trans. title], J. SERVY (*Compt. Rend. Acad. Sci.* [*Paris*], *203* (*1936*), *No. 21, pp. 1097–1100, fig. 1; abs. in Sci. Abs., Sect. A—Phys., 40* (*1937*), *No. 469, p. 87*).—"In previous work (E. S. R., 73, p. 585) simple formulae based on the ratio P/E (rain/evaporation) were sought for as characterizing the dryness factor. Now the index $R=\Sigma(P)/\Sigma(E)$ taken over a period tends towards a constant. To avoid this a new index is devised. This new factor R is such that the influence of any given month decreases with time, so that the effect of that particular month is soon negligible. The relation between R and the humidity H of the soil is then considered and a graph drawn for the years 1932–36. An expression of the form $R=a^{H^m}$ is deduced. From the investigation the author concludes that to each type of soil there is therefore a relation $R=a^{H^m}$ characterizing its real ability to retain water, i. e., to maintain its reserves in given climatic conditions."

Climate and yield of wheat in the region of Paris [trans. title], H. GESLIN and J. SERVY (*Compt. Rend. Acad. Agr. France, 23* (*1937*), *No. 5, pp. 146–152, fig. 1*).—This is an account of a study of precipitation and drought as related to the yield of wheat and of water-holding power of the soil. The maximum yield was obtained with a precipitation of about 280 mm, which is 70 percent of the normal. The highest yield was obtained in 80 percent of the cases when the rainfall during the growing period was below normal. There was a decline in yield in 75 percent of the cases when the rainfall was above normal. In the regions studied, where the reserves of moisture are usually renewed in the fall, a dry year appears to be a good year for wheat. More important than amount and distribution of rain in time were the reserves of moisture in the soil (factor of dryness), for which a formula is given based on water added to the soil and that lost by evaporation.

Rainfall, humidity of the soil, and climate from the agronomic point of view [trans. title], H. GESLIN and J. SERVY (*Ann. Agron.* [*Paris*], *n. ser., 7* (*1937*), *No. 1, pp. 85–101, pl. 1, figs. 3*).—This is substantially a more extensive account of investigations by the same authors noted above. It emphasizes the agronomic importance of amount and distribution of rainfall as a climatic factor, especially conditions determining the reserves of water in the soil, and gives a simple method (index) of estimating the amount of soil moisture (drought factor) which may be expected under a given set of conditions.

Influence of Mediterranean forests on climate [trans. title], A. PAVARI (*Georgofili* [*Firenze*], *6. ser., 2* (*1936*), *No. 4, pp. 475–501, pls. 3, figs. 11*).—This

.rticle discusses in general and reports observations on the influence of differ-ınt kinds of forests on climate, with special reference to Italian conditions. t deals particularly with effect on temperature and moisture of the soil and he air and on wind movement.

SOILS—FERTILIZERS

New trends in soil science [trans. title], A. A. JARILOW (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 172–177*).—The author outlines certain changes in the viewpoint of Russian soil science since 1920. The tendency to turn from the purely scientific viewpoint toward that which regards soil science as also one of the bases of an agricultural industry is emphasized.

The present development of soil study in China, T. Y. TANG (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 136, 137*).—This author states that "about the year 2210 B. C., Da Yu, the first emperor of the Hsia dynasty, took up the study of the soils of nine territories and classified them according to their color, texture, geographical features, and productivity for the purposes of evaluation and assessment of land taxes. Although the classification can hardly be regarded as scientific from the modern pedological standpoint, still it must be considered remarkably comprehensive and systematic for that early period when scientific knowledge was so limited." Recent soil studies have been of limited extent and mostly confined to fertility questions. A comprehensive study of the soils of China was begun, however, in 1930. The progress of this work is outlined.

[Soil investigations of the Delaware Station] (*Delaware Sta. Bul. 205 (1936), pp. 18, 19, 25, 26, 45, 46*).—Notes are given on the effect of lime on the availability of potash on soils, by H. C. Harris; the effect of fertilizers and cropping upon the nature and amount of electrodialyzable bases in the soil, with particular reference to potassium, by G. M. Gilligan; and the influence of copper and zinc salts on the soil flora, by T. F. Manns, W. L. Churchman, and M. M. Manns.

[Soil investigations of the Iowa Station] (*Iowa Sta. Rpt. 1936, pts. 1, pp. 50, 51, 63–70, 109; 2, pp. 9–20, fig. 1*).—The report contains in part 1 concise summaries of work on the value of sweetclover as a soil-building crop, by P. E. Brown, J. L. Boatman, and L. W. Forman; the occurrence and activities of *Azotobacter* in Iowa soils as influenced by soil treatment, utilization of carbonaceous materials by *Rhizobium*, effects on crop yields and soil conditions of small applications of fine limestone drilled in the row for starting new seedlings of legumes on acid soils, and the occurrence and activities of legume bacteria in acid soils as influenced by soil treatment, all by R. H. Walker; the decomposition of lignin in soils, decomposition of leguminous green manures in acid and limed soils, relation of carbon dioxide in soils to the availablity of phosphorus and potassium, and the decomposition of some humus-forming materials in soils, all by F. B. Smith; the relation between the capillary tension and the moisture content of soil as determined by porous ceramic cells and relation of capillary conductivity to the capillary tension and moisture content of soil, both by L. A. Richards; soil erosion reconnaissance survey of Iowa, by Walker, Brown, R. E. Uhland, and W. DeYoung; the basin method of treating pastures to prevent erosion and run-off, by E. V. Collins; and the relation of plant cover to erosion control, by J. M. Aikman and A. F. Dodge.

Part 2 contains statements of progress on the effects of fertilizers under various rotations and effects of various amounts of fertilizers applied at different times in the rotation on crops and soil conditions in the Wisconsin

drift soil area, and character, fertilization, and management of high lime and alkali soils of Iowa, all by Brown, Boatman, and Forman; effects of various fertilizing materials on crop growth on the Carrington, Grundy, Tama silt, terrace and bottomland, and Webster soils and on the chemical and bacteriological conditions in the soils, all by H. R. Meldrum and A. J. Englehorn; the effects of various fertilizing materials on crop growth on the Clarion loam and Marshall silt loam, and on the chemical and bacteriological conditions in the soil, both by Meldrum; effects of various fertilizing materials on crop growth on the Muscatine silt loam and Clinton silt loam on the chemical and bacteriological conditions in the soil, both by Englehorn; plant food content and lime requirements of Iowa soils and the composition of various crops, by Brown and Englehorn; and soil erosion on the Marshall silt loam in Page County, Iowa, by Brown, Smith, G. B. MacDonald, J. B. Davidson, H. D. Hughes, O. R. Neal, and R. A. Norton.

[Soil chemistry investigations of the New Mexico Station] (*New Mexico Sta. Rpt. 1936, pp. 47, 48, 50*).—This station reports briefly on effects of irrigation and cropping on soil profiles, on irrigation waters, on the soluble matter of the soil profiles, and on the colloids of Gila clay adobe.

A method of land classification, L. E. Tavener (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 140, 141*).—"Since the development of the land at any particular time depends not only on the physical factors which determine what the land can produce but also on the economic factors which determine what shall be the development, the soil map should form only part of the basis of land classification." Maps exhibited by the author to Commission V were constructed on the double basis of soil survey data and crop and livestock distribution.

The land classification scheme of the Land Utilisation Survey of Britain, L. D. Stamp (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 138–140*).—"The scheme of land classification adopted by the Land Utilization Survey of Britain is based essentially on existing land use. . . . The main object of the survey has been to record the present use of every acre of England, Wales, and Scotland."

Six main categories are represented each by a letter symbol and a color. Subclassification is by secondary letter symbol only. The land classes are forest and woodland; arable land; permanent pasture and meadowland; heath land, moorland, and rough pasture; gardens, nurseries, and orchards; and land agriculturally unproductive.

"The maps based on this scheme of classification are clearly in no way substitutes for soil maps, nor do they attempt to evaluate the potentiality of the land. Rather are they supplementary, and a comparison with a soil map will at once reveal areas which are underutilized, but the maps provide (1) a standard of comparison with the past and (2) a basis of planning for the future."

Principles of the genetic classification of soils, B. B. Polynov (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 158–161*).—In considering effects of weathering for genetic soil classification purposes, the author finds it "necessary to distinguish two forms—residual and accumulative weathering crusts.

"The residual crust of weathering or true eluvium is a product of a series of stages, the principal of which are: (1) Debris stage, i. e., the products of mechanical weathering; (2) calcified stage, when the products of weathering lose their most mobile constituents (compounds of Cl and S) and become richer in $CaCO_3$ at the expense of the Ca of silicates and the CO_2 of the air;

(3) siallite saturated stage, when the products of weathering lose not only compounds of Cl and S but also $CaCO_3$, leaving the adsorption complex, however, saturated with Ca; (4) siallite unsaturated stage, when hydrogen begins to take a place among the adsorbed cations; (5) allite stage, when not only Cl, S, and bases are lost but also the Si of silicates, leaving behind the iron and alumina and the silica of quartz.

"But in addition to these we have the accumulative forms of the crust of weathering, i. e., deluvial, proluvial, alluvial, etc., deposits which in dependence on time and place become enriched with mobile compounds and clay: (1) Chloride-sulfate accumulative crust of weathering enriched with chlorides and sulfates; (2) carbonate accumulative crust of weathering enriched with $CaCO_3$ but devoid of chlorides and sulfates which have been washed out (loess); (3) siallite accumulative crust of weathering deposits which have lost chlorides, sulfates, and carbonates but which may still contain mobile SiO_2, Al, and Fe. It cannot be doubted that the distribution of the various forms of the crust of weathering is dependent not only on climate but also on relief and time." On the basis of the above considerations and concepts developed from them, "the first part of a genetic classification of soils ought to be built."

The second, and equally essential, basis for genetic soil classification, in the the author's opinion, lies in "the method of concurrent analyses in which we analyze not only the horizons of the soil but the ash of those plants which are growing on that profile." An illustrative example of the value of such concurrent analyses of plant material and the soil affected by the vegetation in question is presented in the form of analyses of an Adzharian soil and of parts of the plant material growing upon it. "The ultimate analysis of soils under that vegetation showed that the uppermost layer in the soil profile always contains distinctly more Al_2O_3 than the lower ones. . . . This distribution of Al_2O_3 shows sufficiently clearly that it is returned to the soil in the falling leaves when these decompose. This explained to us that peculiarity of Adzharian soils which until now had not been understood. It explained why, notwithstanding the very favorable conditions, we do not find a typical development of the Podzol profile."

Soil mineralogy applied to problems of classification, R. HART (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 161, 162*).—"In Scotland, from field studies of soils it is recognized that of the several factors influencing the development of the soil geological conditions must be taken into account to explain the occurrence of different soil types under exactly similar climatic and topographic conditions. For instance, in the east and southeast of Scotland Brown soils occur quite generally in areas where podzolized soils may also be found on different parent materials. In the northeast region also striking effects of geological conditions on soil development may be seen. In a region of fairly uniform climate the change in soil type is as marked as the change in geological structure. Here occurs a series of rock types, granites and granitic gneisses, diorites and gabbroes, and slates, and marked differences in soil types are found associated with the different rocks. The influence of these basic rocks on the soil type is definitely marked in the development of Brown earth soil types over them in contrast to the podzolized types over the acidic rocks. The study of the mineralogical composition of soils is therefore of service for the determination of the parent material and for the study of the changes resulting through weathering. It also serves as an aid in determining the state of development of the soil type and its position in a genetic scheme of classification."

Relations between the crystal-structure of minerals and their base-exchange capacity, C. H. Edelman (*3. Internatl. Cong. Soil Sci. Oxford, Eng., 1935, Trans., vol. 3, pp. 97–99*).—The author summarizes the purpose of the present brief discussion in the statement that "in this paper we intend to prove that the ideal lattices of the several mineral groups show differences which correlate with the adsorption properties found in an empirical way. That these differences in structure are the real causes of the differences in the adsorption capacity will be made probable."

Cultivated plants and the adsorbed cations of the podzolic soil [trans. title], O. K. Kedrow-Sichmann (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 118–122*).—The author very briefly summarizes experiments on the relation of plant growth to the cations contained in the adsorption complex, drawing numerous conclusions, among which are the following:

The optimal combination of adsorbed bases is dependent upon the individual characteristics of the various plants. When the adsorption complex is not saturated with bases, the power of the soil to support growth can be improved not merely by additions of the calcium ion but by also adding various other ions, as, for example, those of magnesium, sodium, potassium, ammonium, and manganese. Agricultural plants were able to make good growth even when these last-named bases were present in a much larger proportion than has generally been considered permissible. Magnesium carbonate which had not entered into reaction with the soil was found to have a markedly unfavorable effect even when the quantity present in the soil was very small. The ill effect of undecomposed magnesium carbonate in the soil could be counteracted by sufficiently large additions of calcium carbonate.

[**Soil Survey Reports, 1932 Series**] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1932, Nos. 12, pp. 31, figs. 2, map 1; 13, pp. 46, figs. 2, map 1*).—These reports were prepared with the cooperation of the Alabama Department of Agriculture and Industries and the Virginia Experiment Station.

No. 12. *Soil survey of Winston County, Alabama*, M. E. Swann et al.—Winston County consists of 403,200 acres of generally rough or hilly lands in northwestern Alabama. Certain terraces and first bottoms are ill drained, the remaining soils well drained. These better drained soils have been for so long a time subject to leaching that they "are naturally low in mineral plant nutrients. They are highly deficient in organic matter and, therefore, nitrogen, one of the most important plant nutrients, and their inherent productivity is low."

The soils of this area were found to constitute 7 series of 8 types. The most extensive of the classifiable soils as listed is Hartsells very fine sandy loam, of which the greater part takes the form of a rolling phase. This soil covers 24.1 percent of the county. Unclassified and nonagricultural areas total 48.4 percent of the county. They consist mainly of 25.2 percent of Guin soils, undifferentiated, and rough stony land, 23 percent.

No. 13. *Soil survey of Augusta County, Virginia*, R. C. Jurney et al.—Augusta County consists of 636,800 acres of valley land between mountainous borders, for the most part adequately drained, in northwestern Virginia.

The soils are here mapped and described as 15 series containing 28 types. Muskingum stony fine sandy loam, steep phase, is the most extensive soil of the county, of which it constitutes 22.2 percent. "The relief is steep and broken, and none of the land is used for crops." Frederick silt loam, including gravelly, hilly, and stony phases, makes up a further 17.7 percent of the county.

Soils of Iowa, P. E. BROWN ET AL. (*Iowa Sta. Spec. Rpt. 3 (1936), pp. 261+4, figs. 485*).—This is a general summary of soil survey findings to date and of related results of soil investigations, including field experiments. The chapters and their authors are as follows: The soils of Iowa, the soil survey, and the soil types of Iowa, all by Brown; the geology of Iowa and the soil areas of Iowa, both by B. J. Firkins and Brown; the phosphorus, nitrogen, and carbon content of Iowa soils, by R. H. Walker and Brown; productivity ratings for Iowa soils, by Brown, T. H. Benton, and C. L. Orrben; and field experiments on some of the major soil types in Iowa, by Brown, H. R. Meldrum, and A. J. Englehorn.

A soil survey of the sugar beet soils in southern Sweden, O. ARRHENIUS (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 122, 123*).—The survey mentioned covered about 500,000 ha (1,235,000 acres) and involved the determination of pH value, available phosphate, nitrate production, and chlorine content. The author deals here only with the general nature of the value of the phosphate determinations and the maps, prepared for the use of farmers, which show where and in what quantities phosphatic fertilizers are needed.

New map of the soils of Russia [trans. title], L. I. PRASOLOV (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 132–136*).—The author presents a general description of a new map, to the scale of 1 cm : 10 km, of which 20 sheets, representing about 3,000,000 sq. km, have been completed. The soils of the plain of eastern Europe were divided, for the purposes of the map, into the three series eluvial soils, the salinization and desalinization series, and marsh and swampy meadow soils. The first of these series, comprising the greater part of the soils mapped, is further subdivided.

Soil maps of Spain and Morocco, E. H. del VILLAR (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, p. 132*).—This note very briefly describes two soil maps, drawn to the scales 1 : 400,000 and 1 : 1,500,000, respectively, of the Luco-Iberian Peninsula and of Morocco. The soils shown on these maps are named, and the method of mapping them is indicated.

Some comments on the soils of Tunisia [trans. title], V. AGAFONOFF (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 137, 138*).—The author, who has recently completed a tour of about 9,000 km (5,580 mi.) made for the purpose of a field study of the soils named, attributes the natural development of Tunisia to the struggle between the influences of the Mediterranean and the Sahara. In spite of the capricious irregularities of the climate, he found it possible to set apart four climatic divisions, namely, the northern zone, having from 600 to 1,500 mm of rainfall annually; an intermediate zone, from 400 to 600 mm; a central zone, from 150 to 400 mm; and a southern zone, having less than 150 mm (6 in.) of rainfall annually. The nature of the soil development which has taken place under each of the first three climatic influences is outlined.

Some observations on the soils of tropical Africa, C. G. T. MORISON (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 141–145*).—"It was found possible to delimit the area into three important units, in the first of which the rainfall was about 250 mm [10 in.] per annum and fell in the months of August and September. In the second area the rainfall averaged 760 mm and occurred in the months of July, August, and September. In the third area the rainfall was from 1,500–2,000 mm and fell in the 6 mo. from April to September. It was found possible to distinguish certain main types of soil and their associated vegetation which appeared to persist throughout the

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three regions, and from which it was consequently possible to deduce certain general statements with regard to tropical soil." Certain main factors upon which the nature of the soils is held to depend and topographic characteristics of the terrain are indicated, and the general outline of the classification scheme is presented.

Some aspects of the black cotton soils of Central Provinces, India, D. V. Bal (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 154–158*).—"The lime content of these soils generally varies inversely with the rainfall of the localities in which they are found. Appreciable amounts of calcium and silica are leached from the surface soil. A certain amount of clay is also washed down continually from the surface soil. These soils contain a low percentage of nitrogen and organic matter. The rate of (1) biological oxidation of organic matter, (2) formation of ammonia and nitrates from organic nitrogen is very vigorous. In these heavy soils the biological activities are at their best when the moisture content is about half the maximum water-holding capacity. Nitrification in artificially watered soils previously air-dried is slower in starting than with soils receiving natural rainfall, but the nitrifying efficiency after a period of 8 weeks is about the same. A heavy clay soil which has lost its texture shows at first a diminished nitrifying power when compared with the same type of soil in good condition. The nitrifying organisms of the soil can tolerate a fairly high concentration of free ammonia and form nitrates from it in the soil."

Some important soil groups of Ceylon, A. W. R. Joachim (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 148–154*).—The author finds that major soil groups of the island of Ceylon may be classified as follows: The laterite soils, the red and yellowish lateritic and nonlateritic earths; soils similar to the Terra Rossa soils; the mountain steppes (Patanas); soils derived from Pleistocene and recent deposits; and the paddy (Gley) soils.

He presents a short general statement of the delimiting characteristics of each of these groups, illustrating in each case with the profile description and horizon analyses one or more members of the group.

Soil surveys in the Netherlands Indies, H. J. te Riele (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 145–147*).—"In the Netherlands Indies, soil surveys are carried out, both on behalf of the Government and by the several private experimental stations, for specific crops." The various methods and viewpoints of the surveys carried out by these separate agencies are outlined.

Report of proceedings of the Seventh Southwest Soil and Water Conservation Conference (*7. Southwest Soil and Water Conserv. Conf., Stillwater, Okla., 1936, Proc., pp. 83*).—These proceedings contain special reports on Progress of Soil Conservation Work in Region Four, by L. P. Merrill (pp. 5–8); The Progress Made in Wind Erosion Control in the Southern High Plains Region, by H. H. Finnell (pp. 9–11); The Outstanding Experimental Results in Erosion Control at Temple, Texas, by E. B. Deeter (pp. 12–14); Watershed and Hydrologic Studies, by C. E. Ramser (pp. 14–22); Progress in the Central Plains Area—Region No. 7, by N. E. Winter (pp. 22, 23); Soil and Water Conservation Investigations, by G. W. Musgrave (pp. 40–45); Recommendations for Research Relating to the Control of Wind Erosion, by H. V. Geib (pp. 45–51); Soil and Water Conservation on Land Utilization Projects in Oklahoma and Texas, by G. Briggs (pp. 51–54); A Study of Gully Formation and Control in Oklahoma, by H. J. Harper (pp. 54–64); The Cost of Terracing With Power Equipment, by D. G. Carter and W. C. Hulbert (pp. 64–68); The Importance of Vegetative Growth on Erosion Control, by A. E. Aldous (pp. 69–72); and

Grass and Legume Studies in Connection With Pasture Improvement and Erosion Control at the Red Plains Soil Conservation Experiment Station, by H. M. Elwell (pp. 72–75).

Some aspects of soil erosion control in the United States, H. KOHNKE and J. S. CUTLER (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 177–180*).—The authors, both of the U. S. D. A. Soil Conservation Service, summarize the present erosion situation in the United States in the statement that "it may be said that the safe use of land in different areas depends upon the productive capacity and the slope of the land. In general, the more gentle slopes can be economically protected from excessive erosion by purely agronomic methods, such as fertilization, planned crop rotations, strip cropping, and contour tillage, or by the use of terraces. The steeper lands can be economically utilized as meadow or pasture, while the excessively steep slopes can best be devoted to forest, climatic conditions permitting, or to pasture. Farm management studies have shown that the adoption of erosion control methods will result in no immediate loss of return and over a period of years actually increase the income of the farmer."

Comparison of runoff and erosion in prairie, pasture, and cultivated land, J. E. WEAVER and W. C. NOLL (*Nebr. Univ., Conserv. and Survey Div., Conserv. Dept. Bul. 11 (1935), pp. 37, figs. 11*).—The results of run-off and erosion measurements from entire watersheds and from run-off plats are presented and discussed.

Enclosed plats 3 ft. wide and 33.3 ft. long were used in these studies. Natural rainfall was supplemented by artificial watering. Run-off on a 10° slope from 26.88 in. of rainfall during 15 mo. was 2.5 percent from prairie, 9.1 from overgrazed pasture, and 15.1 percent from a pasture entirely bared by close grazing. The soil was Carrington silt loam. No measurable amount of soil eroded from the prairie, and only a small amount from the pasture, but 5.08 tons per acre were lost from the bare area.

Run-off from 4 in. of water applied to pasture and prairie, respectively, in July 1934, at the rate of 2 in. per hour (including 1 in. applied in 15 min.) at intervals 2 weeks apart, resulted in 3.1 and 9.8 percent run-off. In April of the next year 2.5 in. were applied at the same rate to prairie, pasture, and bare area. Run-off losses were 0, 29.3, and 50.4 percent, respectively, and losses by erosion at the rate of 0, 165 lb., and 3.42 tons of soil per acre.

In October, after another summer of close grazing and root deterioration, 3 in. of water were applied in 1.5 hr. to each area. Run-off from prairie, pasture, and bare area was 11.3, 50.5, and 71.6 percent, respectively, and soil losses from erosion at the rate of 0, 355 lb., and 4.67 tons per acre. Water penetration was nearly four times as great in prairie as in pasture.

Run-off on a 5° slope from 12.9 in. of rainfall during a period of 11 mo. was 1 percent from the prairie, 12.1 from wheatfield, and 17.8 percent from fallow land. The soil was Carrington silt loam. No measurable erosion occurred in prairie, 0.52 ton of soil per acre eroded from the wheatfield, and 2.6 tons from the fallow land.

Five in. of water were applied to prairie and wheat stubble and 4 in. to fallow land during a period of 2 days. Run-off was 3.1, 27.6, and 23.2 percent, respectively, and soil erosion was at the rate of 0, 1.29, and 1.75 tons per acre in the same sequence.

Run-off from prairie and young alfalfa on Carrington silt loam with a 5° slope during a period of about 7 mo. was 3.8 and 19.2 percent, respectively, from a total rainfall of 10.6 in.

Four in. of water applied to each plat in spring when the alfalfa was 5 in. tall resulted in 5.9 percent run-off in prairie and 40.8 percent in alfalfa. No erosion occurred in the grassland, but 0.72 ton per acre in the field.

Run-off resulting from the application of 3 in. of water in 1.5 hr. on May 10 on a 7° slope on Lancaster sandy loam was nil from burned prairie, but 20 percent from broken prairie cropped to corn for a period of 6 yr. Topsoil lost by erosion was at the rate of 12.2 tons per acre.

A soil covered with its natural mantle of climax vegetation represents conditions most favorable to maximum absorption of rainfall and maximum erosion control.

Analysis and control of landslides, R. G. HENNES (*Wash. Engin. Expt. Sta. Bul. 91 (1936), pp. 57, figs. 17*).—The purpose of this bulletin is to develop, in outline, an applied science of landslide control. The approach to this goal consists of (1) investigation of the nature of the shearing strength of soil, (2) investigation of the load conditions which result in exceeding this strength, and (3) application of the theory to the practical problems of analysis and control.

Part 1 deals with friction and cohesion, part 2 with the computation of the stability of slopes, and part 3 with the actual occurrence of landslides. The principles thus developed are then applied to the selection of proper methods of control. A method for determining the proper spacing of piles is developed, and methods are suggested for the design of works for drainage of gravitational and of capillary water.

It is pointed out that the application of new methods to problems connected with landslides has become possible through the development of tests to measure the physical properties of soils. To a large extent the efficiency of landslide control must depend on the accuracy with which the properties of soil have been determined for the individual case.

Results of agronomic-hydrotechnical drainage experiments on clay soils [trans. title], H. FLODKVIST (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 164–168*).—The author briefly discusses the movement of water in drained soils and presents the bases of a theory, applicable within certain limiting conditions, with regard to transverse drainage.

On the determination of the drainage rate [trans. title], V. SETINSKI (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 163, 164, fig. 1*).—The author here presents, in abbreviated form, the development of an equation for the rate of drainage of a given volume of a soil.

Subsoil structure and crop nutrition, E. M. CROWTHER (*3. Internatl. Cong. Soil. Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 126–139*).—The author "advances the hypothesis that some of the more deeply rooted farm crops in humid temperate climates utilize water, nitrates, and possibly other soluble nutrients stored through the winter in the lower horizons of loams and heavier soils, provided that these are well drained and have a well-expressed soil structure." As an illustrative example, he notes that "we have obtained in parallel experiments over 5 yr. four responses of potatoes to potassium at Rothamsted but none at Woburn, and, on the other hand, no responses of sugar beet at Rothamsted but two at Woburn. Before one can decide which soil is deficient in available potassium, one must bear in mind the rooting habits of the crop and the general nature of the subsoil." To obtain really satisfactory information "it is necessary to join the laboratory and field methods by studying the relationship of the roots to the physical and chemical composition of the lower horizons. Even though the difficulties of sampling subsoils are great, it may prove possible to study the changes in the surface soils under different

systems of rotation, cropping, and manuring and interpret these in terms of the general properties of the subsoil and the root ranges of the crops."

On the study of the fertility of the soils of the Belgian Congo [trans. title], J. Baeyens (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 129–131*).—The author defines as a growth factor any cause, physical, chemical, physiological, or climatic, capable of a favorable effect upon a given crop. Although these growth factors are numerous and not altogether known and a scale of fertility cannot be based upon any one, or even two or three, of these factors, the author believes the following to form an adequate basis for judging the fertility of a soil under consideration: (1) Mechanical composition of the soil, (2) the effectiveness of utilization of the soil water and atmospheric moisture, (3) the plant food resources (exchangeable bases and phosphate), (4) the biological analysis (under which are included micro-organisms, carbon dioxide production, nitrates, catalytic power, and content of organic matter and nitrogen), and (5) the general appearance of the profile. The use of these factors, taken together, as indexes of general soil fertility is discussed briefly.

The decomposition of lignin in plant materials, A. G. Norman (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 105–108*).—"The determination of lignin is affected by the presence of pentose units and proteins unless special precautions are taken. Determinations made on decomposing plant materials are apt to be misleading because pentose-containing hemicelluloses are being progressively removed and microbial protein concurrently synthesized. When these disturbing factors are taken into account, it may be shown that lignin under aerobic conditions is slowly but steadily fermented. In a sample of oat straw, at least 40 percent and probably over 50 percent of the lignin was removed in 12 mo."

***Some physical factors controlling the accuracy in estimating the number* of nitrogen-fixing bacteria in soil**, H. W. Batchelor (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 113–117, figs. 4*).—This note, contributed from the Ohio Experiment Station, is concerned mainly with effects of the method of dispersion upon counts subsequently obtained. Figures concerning the rate of shaking and the time lapse between shaking and sampling are graphically presented.

"Although additional work should be conducted on this problem before any particular method is suggested as the one most nearly meeting the requirements for accurate studies on the populations of these organisms in soil, it is believed that the data indicate the need of carefully standardized procedures in any investigations involving the determination of the populations of the soil flora."

Nitrogen fixation by rice soils and rice plants, D. L. Sahasrabuddhe (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 111–113*).—As one of the results of the investigation here concisely outlined, "it can . . . be safely stated that nitrogen-fixing inoculum is not carried within the rice seed, although it may be carried on the surface of the seed. On the other hand, it is certain that the inoculum is in the rice soil and may be carried along with the soil. The presence of the growing rice roots helps this inoculum in fixing larger quantities of nitrogen than the soil would otherwise fix because the rice roots form a good host."

Phosphate investigations in Montana, 1936 (*Montana Sta. Bul. 334 (1937), pp. 22, figs. 4*).—This bulletin consists of two separate articles.

I. *Tests with alfalfa and other farm crops*, J. Green.—Phosphate fertilizers increased the yields of crops, especially those of alfalfa. Alfalfa fertilized with phosphate contained more moisture at harvest time than unfertilized

alfalfa. Phosphate-treated alfalfa showed increased yield and phosphorus content when the crop was grown in phosphorus-deficient soils.

"Phosphate fertilizer should, if possible, be placed at a depth in the soil where there is ample moisture. When rainfall is low phosphate placed near the surface is of little value in fertilizing the crop. The addition of a phosphate fertilizer does not improve crops that are badly injured by drought or grasshoppers. Alfalfa is a much greater user of phosphate than the grain crops."

II. *Phosphorus responses on potatoes*, F. M. Harrington and W. E. Pollinger.—Phosphate-treated plants came up before those not treated, made a more rapid early growth, and showed a larger root development, together with an earlier and heavier set of tubers. Phosphate treatment usually improved both yield and grade.

Phosphate fertilizer mixtures: Chemical changes and physical effects **induced in mixtures of triple superphosphate with dry and wetted limestone and dolomite,** W. H. MacIntire, L. J. Hardin, and F. D. Oldham (*Indus. and Engin. Chem., 28 (1936), No. 6, pp. 711-717, figs. 3*).—At the Tennessee Experiment Station, "laboratory and field mixtures were studied to secure information for guidance in practice. Speed and extent of diphosphate transitions were computed from carbon dioxide evolutions in closed systems and from decreases in the water-soluble P_2O_5 content of larger piles." Prewetting of the limestone and dolomite was introduced "to accelerate reaction and to expedite the dry mechanical condition that characterizes maximal diphosphate transition and in particular to increase the content of readily available magnesia in the dolomite mixtures." The divergence between the mechanical effects of dry and wet admixtures and also between the effects of machine and hand mixing, the elimination of set-up by reworking the mixtures before storage, the conditions found in unconfined and in immediately bagged mixtures, and related factors were considered.

The role of elements other than nitrogen, phosphorus, and potassium in crop production, L. E. Wright (*Sci. Agr., 17 (1937), No. 5, pp. 283-293*).—From the review and experimental data presented it is concluded that a sufficient amount of boron in an available form in the soil is necessary for the healthy growth of mangels, turnips, and apples. Calcium, magnesium, sulfur, iron, manganese, copper, and zinc are also considered.

AGRICULTURAL BOTANY

[Report of the] division of plant biology, H. A. Spoehr (*Carnegie Inst. Wash. Yearbook, 35 (1935-36), pp. 195-230, fig. 1*).—Progress reports are given on biochemical studies (including carotenoid pigments, the absorption of carbon dioxide by the unilluminated leaf, the amylolytic activity of leaves, and the chemistry of the cell walls in wood), by Spoehr, J. H. C. Smith, H. H Strain, and H. W. Milner; investigations on the cambium and its derivative tissues, by I. W. Bailey; experimental taxonomy (including the principles and problems, the species problem, investigations on Madinae, transplant studies, and other investigations), by J. Clausen, D. D. Keck, and W. M. Hiesey; desert investigations (including field work, environmental conditions, and the behavior of desert plants), by F. Shreve, T. D. Mallery, and W. V. Turnage; ecology (including adaptation and origin, by F. E. Clements, F. L. Long, and E. V. Martin, and climate, climax, and succession, by F. E. and E. S. Clements); paleobotany, by R. W. Chaney; and climatological research (including fundamental studies, climatic influence in trees, cycle studies, and long chronologies), by A. E. Douglass.

Contributions to the electrophysiology of growth, M. G. Kholodnii (N. G. Cholodny) and E. Kh. Zankevich (E. Ch. Sankewitsch) (*Zhur. Inst. Bot. Ukrain. Akad. Nauk* (*Jour. Inst. Bot. Acad. Sci. Ukraine*), *6* (*1936*), *No. 15, pp. 105–124, figs. 3; Eng. abs., pp. 123, 124*).—After a critical review of recent literature (12 titles) on the electrophysiology of growth, the authors report their experiments designed to check on the hypothesis that transportation of growth substance in the plant organs takes place through cataphoresis. Their results are believed to confirm the view that the electric current affects the transportation of hormones not directly as electrolytes but indirectly through the complex system of living protoplasm.

The absorption of electrolytes in large plant cells, W. J. V. Osterhout (*Bot. Rev.*, *2* (*1936*), *No. 6, pp. 283–315, figs. 4*).—This review (with bibliography of 128 titles) considers the kinetics of penetration, accumulation, selective permeability, and the nature of the protoplasmic surface. It is stated that "the facts and principles here set forth are the results of investigations of large cells which offer special advantages for such studies. How far they are applicable to other cases remains to be seen. This brief outline indicates progress in dealing with some very interesting variables. It also gives a hint of the host of problems awaiting solution."

Water relations and osmotic pressures of plant cells, T. A. Bennet-Clark, A. D. Greenwood, and J. W. Barker (*New Phytol.*, *35* (*1936*), *No. 4, pp. 277–291, figs. 3*).—The so-called "osmotic value" of the cell sap as determined by the plasmolytic method was markedly greater than the osmotic pressure as determined by the cryoscopic method in roots of beet and swede and petioles of *Begonia*, but in petioles of *Caladium* and *Rheum* the results were equal. The former tissues thus showed a positive water secretion from the external medium into the vacuoles in addition to the inward flow due to the osmotic pressure of the cell sap. In *Caladium* and *Rheum* the flow of water was conditioned by the osmotic pressures only.

It is shown that the cells of tissues with active water-secreting powers should not be plasmolyzed by their own expressed sap, whereas juice from tissues not possessing water-secreting powers should plasmolyze about half of the cells of the tissue. This was demonstrated experimentally, thus confirming the conclusion that the osmotic pressure of the vacuole is not the sole force sending water into the cell (at any rate in potential growing tissues).

Electrophoresis trials in the interior of the plant cell [trans. title], A. Guilliermond and N. Choucroun (*Compt. Rend. Acad. Sci.* [*Paris*], *203* (*1936*), *No. 3, pp. 225–229, figs. 2*).—Using electrophoretic methods on cells of the epidermis of onion bulb scales, of the perianth of tulip flowers, of leaves, bracts, and flowers of *Iris* spp., and of leaves of *Elodea*, the author studied the effects of an electric field on the morphological constitutents of the cell. No action of this field on the charged elements within the living cell was noted. This defense mechanism of living material, a property doubtless important for the maintenance of equilibrium, is believed to have been reported here for the first time.

An attempted theory of photosynthesis, J. Franck and K. F. Herzfeld (*Jour. Chem. Phys.*, *5* (*1937*), *No. 4, pp. 237–251, figs. 3*).—"An attempt is made to explain quantitatively many observations described in the literature on the photosynthetic production of oxygen in its dependence on light intensity, time of irradiation, etc. Four photochemical steps and two dark reactions are assumed in which, among others, a peracid, formic acid, and a peraldehyde occur. These are the same intermediate compounds as in auto-oxidation processes, so that the similarity between these two inverse processes is striking.

Light saturation is explained by back chain reactions initiated by photolytical decomposition of the percompounds. The agreement between observations and calculations is good. The picture gained for the photosynthesis of CO_2 can be applied in the same way for that of plant acids, but the plant acids can also be photo-oxidized in a reaction sensitized by chlorophyll."

The mechanism of utilization of radiant energy in the process of photosynthesis [trans. title], A. N. Danilov (Danilow) (*Trudy Bot. Inst. Akad. Nauk SSSR, Ėksper. Bot.* (*Acta Inst. Bot. Acad. Sci. URSS, Bot. Expt.*), *4. ser., No. 2 (1936), pp. 5–76, figs. 15; Ger. abs., p. 72*).—On the basis of assimilation tests with blue-green, red, and green algae exposed to white and colored electric lights, it is concluded that both the quantitative and qualitative composition of the light and the reciprocal relations of the group of rays making up a light source all have great significance for the photosynthetic process. A bibliography of 85 titles is included.

About influence of potassium on the gaseous exchange and the accumulation of chlorophyll in buckwheat, V. A. Brilliant (*Trudy Bot. Inst. Akad. Nauk SSSR, Ėksper. Bot.* (*Acta Inst. Bot. Acad. Sci. URSS, Bot. Expt.*), *4. ser., No. 2 (1936), pp. 77–91, fig. 1; Eng. abs., pp. 89, 90*).—The photosynthetic capacity of buckwheat was lowered most with excess potassium, in a smaller degree with traces, and still less with 2 mg per liter of culture solution. Respiration was increased with subnormal or excess amounts of potassium. The decrease in photosynthesis and increase in respiration were correlated with diminished dry matter when potassium was deficient or excessive, but no correlation could be detected between variations in gaseous exchange and diminishing dry weight. The chlorophyll content was somewhat lowered with potassium absent, it equaled that of the controls with 2 mg per liter of culture solution, and it was much lower in amount with excess potassium.

The influence of accumulation of carbohydrates in the leaf tissues on the energy of photosynthesis and respiration [trans. title], A. G. Toshchevikova (Tostchevikova) (*Trudy Bot. Inst. Akad. Nauk SSSR, Ėksper. Bot.* (*Acta Inst. Bot. Acad. Sci. URSS, Bot. Expt.*), *4. ser., No. 2 (1936), pp. 93–111; Fr. abs., pp. 109, 110*).—By the simultaneous processes of photosynthesis and direct absorption of sugars from solutions, maximum quantities of carbohydrates were obtained amounting to 42 percent of the dry weight in leaves of *Primula obconica* and 17 percent in those of *Hedera helix*. These results confirm the conclusion that leaves of different species accumulate different maximum amounts of plastic carbohydrates. The energy of respiration increased with an increase in the carbohydrate content of the leaves, and the maxima of the two processes were simultaneous. Photosynthesis also increased up to a certain limit, but when the accumulation of sugars and starch became very high the energy of photosynthesis diminished, and it became very feeble when their maximum amounts were reached.

The photoperiodism and the growth of the tea plant, V. N. Pokrovskiĭ (W. N. Pokrovsky) and S. G. Merabian (*Sovet. Subtrop.* (*Soviet Subtrop.*), *No. 11 (27) (1936), pp. 37–55, figs. 7; Eng. abs., p. 55*).—Acclimatized Chinese-Indian hybrids and the nonhardy Indian species were tested in western Georgia (1932–35) as to the influence of shortened daylight periods. By the use of suitable photoperiods the authors were able for the first time in the U. S. S. R. to obtain hybrids of the northern and southern forms.

The influence of day length in connection with artificial illumination of plants in winter [trans. title], J. W. M. Roodenburg (*Ber. Deut. Bot. Gesell., 55 (1937), No. 1, pp. 5–32, pls. 5, fig. 1*).—It is shown that with medium light intensities and times of illumination leaf development is proportional to the light

quantity (duration × intensity). Thus the leaf develops in direct correlation with CO_2 assimilation. On the other hand the specific influence of day length is expressed in relation to induction of the flowering period, and, within wide limits, it stands in no relation to light intensity. Here the specific effect depends exclusively on the duration of daily illumination. From these and other experimental results with cucumbers and strawberries grown in the greenhouse, it is postulated that the lack of any relation at all with CO_2 assimilation and the very far-reaching agreement with the cell-stretching hormones render it probable that the length of the daily light period in one manner or another controls the growth conditions of the plant.

The action of light on the germination of light-arrested fruits of the Gramineae [trans. title], E. Zeiher (*Jahrb. Wiss. Bot., 83 (1936), No. 1, pp. 60–104, figs. 2*).—This is a study of the germination relations of *Poa pratensis* and four species of *Bromus*, including the relations between the fat in the seed and the behavior of light and dark embryos toward light.

The action of radiation of specific wave-lengths in relation to the germination of light-sensitive lettuce seed, L. H. Flint (*Compt. Rend. Assoc. Internatl. Essais Semences (Proc. Internatl. Seed Testing Assoc.), 8 (1936), No. 1, pp. 1–4, fig. 1*).—Continuing this series of studies (E. S. R., 74, p. 638), the present work made use of specific wavelengths employing a large spectrum, a single-filament incandescent light source, a condenser lens, concentration of light on an adjustable slit, an achromatic lens, a prism, and a silvered mirror. The detailed results given make it apparent that some components of white light promote germination while others inhibit it. The net effect of white light on germination is thus indicated as associated with the dominance of either the promoting or the inhibiting influence. Hence, in those seeds whose germination is hindered by white light a relatively greater absorption of the radiation inhibiting germination is suggested. In light-sensitive lettuce seed the net effect of white light is to promote germination.

The wavelengths inhibiting and promoting germination are correlated, respectively, with those inducing bending of plants toward the light and those promoting carbon fixation. It is thus concluded that the study of seed germination may have an intimate and important bearing not only on the immediate problems relating to seeds, but also on a wide range of problems covering the activities of plants in general.

Stem and leaf anatomy as influenced by supplemental light, F. Ramaley (*Colo. Univ. Studies, 23 (1936), No. 3, pp. 245–250, figs. 24*).—Of the 25 plant species from various families given full winter daylight exposure in the greenhouse, with additional illumination increasing the day length 4 hr. or more (using electric lamps furnishing 30 footcandles at the level of the plants), 15 showed no appreciable anatomical differences between plants given long- and short-day exposures. In some species, however, the experimental plants were slenderer than controls exposed only to winter daylight, the vascular tissue was greatly reduced, the vessels tended to be smaller, and the phloem elements were smaller and fewer in number. Starch was usually absent from the experimental plants. The leaves were less modified than the stems, although a general tendency existed for leaves of the treated plants to be thinner, with a looser spongy tissue. Roots of experimental plants were nearly always reduced, especially as to the vascular tissue.

Changes in the permeability of protoplasm and the dynamics of frost resistance of winter cereals in connection with their passage through the light stage, E. Šestakov and L. I. Sergeev (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 4 (1936), No. 1, pp. 25–28, figs. 4*).—The authors conclude

from this study that there is a negative correlation between the permeability of protoplasm (rate of exosmosis) and frost resistance in winter cereals, the higher the permeability the lower being the resistance to frost. The further the variety was advanced in its light stage, the higher was its permeability and the lower was its frost resistance. The 9-hr. day, at optimum temperature, retarded, but did not fully prevent, passage through the light stage. Correspondingly, when the plants were kept for 15 days on a 9-hr. day, the permeability of the protoplasm increased and frost resistance fell as compared with the controls.

Studies of the relation of temperature to water intake by plants, with special reference to transition reactions [trans. title], E. ROUSCHAL (*Sitzber. Akad. Wiss. Wien, Math. Naturw. Kl., 144 (1935), I, No. 5–6, pp. 313–348, figs. 6*).—This study deals principally with the water intake at constant root temperature, the transition reactions from warm to cold and the reverse, the reversibility of cold inhibition, and the reciprocal relations of absorption and transpiration.

The action of certain quinoline derivatives on the germination of wheat [trans. title], G. FRON (*Ann. Épiphyt. et Phytogénét., n. ser., 2 (1936), No. 3, pp. 333–340, figs. 2*).—Neutral sulfate of ortho-oxy-quinoline in suitable concentrations influenced favorably the early phases of development in wheat seedlings, and the author calls attention to the fact that these same dosages are also capable of completely inhibiting the development of certain plant parasites.

The dinitrobenzol method of determining the germinability without germination testing, II [trans. title], A. GUREWITSCH (*Ber. Deut. Bot. Gesell., 55 (1937), No. 1, pp. 54–58*).—This method of determining the germinability of seeds is said to depend on the reduction of ortho- and paradinitrobenzol rather than on that of metadinitrobenzol. It may also be used for determining small amounts of ortho- and paradinitrobenzol in metadinitrobenzol.

Effect of extracts from the corn plant on growth of excised root tips, W. J. ROBBINS and V. B. WHITE (*Bot. Gaz., 98 (1937), No. 3, pp. 520–534, figs. 3*).—Milk from immature corn grains was injurious or without benefit to growth of excised corn root tips, the diffusate from germinated corn grains benefited their growth in agar medium containing dextrose and mineral salts, the agar diffusate from coleoptile tips slightly inhibited their growth when less than 1 mm long, and the diffusate from root tips slightly favored their growth. Aqueous extracts of the terminal portions of seedling roots favored growth of excised root tips in an agar medium containing dextrose. Extracts of germinated corn grains at the higher concentrations injured excised corn root tips, inducing hypertrophy of the cortical cells, while at lower concentrations they were beneficial. Replacing the nutrient solution with fresh solution when the growth rate of the excised root tips had decreased resulted in little or no benefit when a mineral nutrient containing dextrose was used, but caused renewed growth when the solution contained root or corn grain extracts or autolyzed yeast.

"The significance of the experiments from the standpoint of a medium suitable for the continued growth of excised corn root tips is discussed."

Mitochondria in the life cycles of certain higher plants, L. E. ANDERSON (*Amer. Jour. Bot., 23 (1936), No. 7, pp. 490–500, figs. 27*).—In *Antirrhinum majus*, *Philadelphus coronarius*, and *Hyacinthus orientalis*, it was possible to demonstrate mitochondria (used to include plastid primordia) and plastids in structures in which they had not previously been reported by using fixatives on the basic side of pH 4.2–5.2. All living cells studied contained plastid primordia, the development of which could be traced in the stem growing point and in

the leaf cells. Subsequent organs developed from such growing points contain these primordia. They are present in microspore mother cells from which they are distributed about equally to the microspores, where they are particularly abundant. Transition into plastids was followed in both pollen grains and tubes. These inclusions are carried from the microspores into the pollen tube by the streaming cytoplasm, are particularly numerous about the male nuclei, and they persist at least until the pollen tube ruptures into the embryo sac. Megaspore mother cells contain mitochondria identical in appearance with those in the microspore mother cell, and they are also distributed equally to the four megaspores. The functional megaspore possesses mitochondria which are strikingly abundant around its nucleus, and the nucleus of each daughter cell is in turn surrounded by mitochondria. The egg cell contains both plastids and mitochondria, as do all cells of the embryo sac. The polar nuclei are surrounded by these inclusions both before and after they fuse.

In fertilization of *Antirrhinum*, the pollen tube does not rupture until some time after it has entered the embryo sac but remains for a time in contact with the egg. A protrusion is formed toward the egg, and at that point the tube ruptures. The male nucleus which fuses with the polar nuclei is surrounded by mitochondria, so that the resulting endosperm contains cytoplasmic inclusions from the male plant. The second male nucleus, surrounded by mitochondria, enters the egg and fuses with the egg nucleus. The membrane surrounding the egg, after puncture by the male nucleus, contains an opening large enough for mitochondria to pass in from the pollen tube. Plastids and their primordia are present in all cells of the developing embryo where the transitional stages between mitochondria and plastids are most abundant. These inclusions occur in the cytoplasm of all cells formed before the growing points appear and in the growing points themselves.

It is indicated that if mitochondria from the male cytoplasm enter the egg cell any defective cytoplasmic inclusions in the pollen tube would be transmitted to the egg. Explanations of maternal inheritance which assume that no cytoplasm is transferred from the male to the female plant in fertilization are thus inadequate. Several possibilities are presented.

Parthenocarpy induced by pollen extracts, F. G. Gustafson (*Amer. Jour. Bot.*, *24* (*1937*), *No. 2*, *pp. 102–107*, *figs. 3*).—Chloroform extracts of pollen used to stimulate ovarial growth in a number of plants indicated that there exists in the pollen of some plants a chloroform-soluble material which initiates growth in the ovary and in some cases causes seedless fruits to be formed.

Studies on the bacterial-plant groups of cowpea, cicer, and dhaincha, I, II, M. S. Raju (*Zentbl. Bakt.* [*etc.*], *2. Abt.*, *94* (*1936*), *Nos. 9–13*, *pp. 249–262*; *14–18*, *pp. 337–348*, *figs. 5*).—Two papers are presented.

I. *Classification.*—In this study at the University of Wisconsin, "some strains of nodule bacteria were isolated in pure cultures from the plants of cowpea, gram, and dhaincha groups. Based upon the variations in the cultural characters, three new types are recognizable among the nodule bacteria of the cowpea group. As a result of plant inoculation studies, black gram, cluster bean, cowpea, dew gram, groundnut, horse gram, green gram, indigo, lablab, pillipesara, red gram, sunn-hemp, and wild-indigo were found to belong to the cowpea bacterial-plant group. The cultures of lupine, dalea, soybean, and dhaincha groups are somewhat related to the cowpea group, though the cowpea organisms cannot produce nodules on the plants of these groups. Wide variations in the infective power of nodule bacteria of the cowpea group were observed on different varieties of host plants of the same group. Gram and dhaincha were found to be two new bacterial-plant groups. The cicer group

is entirely distinct from the other groups, while dhaincha is somewhat related to the cowpea group."

II. *Variations in the infective power of the nodule bacteria of cowpea group*—(1) *Influence of light on infection*.—In these studies at the University of Wisconsin, the infective power of a strain varied with the variety of the host. If the light under which the plants were grown was beyond a favorable range, the nodule formation by the weaker strains was inhibited. A heavy inoculum of a soil from India failed to infect some plants with nodule bacteria when the light was deficient. The ultraviolet rays and those of shorter wavelength filtered off by the greenhouse glass seemed to exert very little influence on the infective power of the bacteria. Some of the results indicated the possibility of selection of bacterial strains of higher infective power.

The influence of host plant species in relation to the effectiveness of the Rhizobium of clovers, T. H. STRONG (*Jour. Council Sci. and Indus. Res. [Austral.], 10 (1937), No. 1, pp. 12–16*).—"Strains of the clover-nodule producing organism isolated from subterranean clover have proved effective in association with that plant and ineffective with red and white clover, and vice versa. The organisms freely invade all three hosts. This variation in effectiveness, which can be attributed to specific host plant reaction, is distinct from that displayed by strains effective or partially effective upon one particular host, a variation attributed to 'virulence.' . . . So far, no strains have proved highly effective upon all three host plants."

Studies of the metabolism of Aspergillus niger.—I, The influence of phytin on the metabolic processes of A. niger [trans. title], W. BRAUN and A. FREY (*Biochem. Ztschr., 285 (1936), No. 3–4, pp. 219–227*).—Increases in the phosphorus content of the nutrient solution caused increases in mycelial weight and sugar consumption, but acid formation was less dependent on the amount of phosphorus present. When the nitrogen supply consisted in part of organic salts, acid production decreased with an increase in the phytin phosphorus supply. The sugar consumption and mycelial weight were influenced more by the form of phosphorus than by that of nitrogen supplied. The latter influenced especially the acid production. Most of the phytin not absorbed by the cells was split by phytase. Independently of the nitrogen supply, the phosphorus consumption was in all cases higher with the addition of phytin phosphorus than with that of inorganic phosphorus.

Nitrite and formaldehyde formation in certain algae, A. L. SOMMER (*Plant Physiol., 11 (1936), No. 4, pp. 853–861, figs. 4*).—It was found by this study at the Alabama Experiment Station that light plays an important role in the reduction of nitrate to nitrite in the algal cell. Addition of phosphate to the nutrient accelerated this reduction and the formation of formaldehyde by certain algae. It is thought that nitrites combine with formaldehyde or an early condensation product thereof in the first step of protein synthesis. Protein synthesis and formaldehyde condensation to sugars may proceed simultaneously.

Tree injection, 1935 experiments.—A progress report, J. HEARMAN, B. F. GOODMAN LEVY and W. A. ROACH (*East Malling [Kent] Res. Sta. Ann. Rpt., 23 (1935), pp. 137–141, figs. 4*).—Following injections of fertilizer solutions into apple trees (1935), leaf injury did not show itself immediately but only after an interval of three or more days after injection, so that sufficient fertilizer could be absorbed to cause serious damage before any warning was given. The delayed symptoms were apparently due to the leaves remaining in an "immature" condition for some weeks after expansion, a mature leaf being much more prone to such injury than an immature one. In the experiment

reported, the continued immature condition was probably due to a severe frost. It is concluded that leaf injury cannot always be relied upon as a warning that trees have absorbed sufficient fertilizer.

Variation in a species of Fusarium induced by high concentrations of zinc salts, A. W. Dimock (*Zentbl. Bakt.* [etc.], *2, Abt.*, *95 (1936), No. 13–17, pp. 341–347, figs. 3*).—A single-spore strain of a *Fusarium* species was studied intensively at the University of California over a period of 2 yr. No variation or sectoring was observed in hundreds of single-spore and mass-transfer colonies of this strain on standard media, on media containing great excesses of neutral chlorides, sulfates, or nitrates, or on Coons' medium adjusted to high acidity. However, sectors frequently appeared when cultured on media containing high concentrations of zinc chloride, sulfate, or nitrate, and the evidence indicates that they were induced by the action of zinc on the nuclei or cytoplasm of cells of the parent mycelium. The parent and variant strains were shown by single-spore cultures to be pure and homocaryotic. A single spore of one of the variant strains gave rise to a further variant strain believed to be the result of an aberrant mitosis or a "spontaneous" gene mutation occurring during or shortly prior to the formation of the spore.

"It is suggested that the mechanism of action of the zinc ion lies either in an alteration of the self-perpetuating, extra-nuclear inclusions of the cytoplasm of the parent cells, or in an alteration of the genic constitution of the nucleus."

Toxicity of selenium to plants and animals, A. L. Martin (*Amer. Jour. Bot., 23 (1936), No. 7, pp. 471–483, figs. 5*).—The toxicity to wheat and buckwheat plants was proportional to the concentration added as sodium selenite to soil or solution cultures. The effects varied from a decrease in growth rate with 1, 2, and 4 p. p. m. to extreme chlorosis and premature death with 8, 16, 32, and 64 p. p. m. The effectiveness of sulfur-selenium antagonism in solution cultures proved to be limited. A concentration of 1 p. p. m. could be rendered nontoxic by adding sulfate sulfur to the solution, but higher concentrations of selenium could not be rendered entirely nontoxic by sulfur. A sulfur-selenium ratio of 2.5:1 reduced selenium toxicity nearly as much as a ratio of 40:1. Buckwheat was more susceptible than wheat to selenium injury, and after sulfur additions there was greater residual toxicity to buckwheat. The amount absorbed by buckwheat from artificially selenized soil depended on the quantity applied, and the accumulation in the plant always exceeded the concentration in the soil.

Injury to rats resulted from diets containing ground stems, leaves, and seeds of seleniferous buckwheat grown in field cultures, the degree depending on the concentration in the plants. Small amounts stunted growth, while high concentrations were quickly lethal. Selenium proved more poisonous to the animals than to the plants. Buckwheat exhibiting no symptoms except for slight dwarfing contained enough poison, even when diluted with an equal part of a grain diet, to cause death in rats within 9 weeks.

Soil analyses of artificially selenized field cultures at the beginning and end of a 13-mo. interval indicated that moderate rainfall and cropping had very little effect in reducing the selenium content.

Distribution and ecology of plants significant to wild waterfowl in their breeding grounds in northern Iowa, A. Hayden (*Iowa Sta. Rpt. 1936, pt. 1, pp. 105, 106*).—This is a progress report.

On the influence of various liquid fixatives on stomatal behaviour: A critical contribution to the theory of Lloyd's alcohol fixation method, M. Nadel (*Palestine Jour. Bot. and Hort. Sci., 1 (1935), No. 1, pp. 22–42, figs. 5*).—

Tests with a considerable number of fixatives indicated that none fixed the stomata so that the state of the opening at the time of fixation was truly preserved. The results led to the hypothesis that the varying action of the same fixative on the stomatal mechanism of different species is to be explained on the basis of differences in the structure of the stomatal membranes. It is believed that the arrangement and relative amounts of layers composed of such chemical substances as cutin, cellulose, etc., in the stomatal membranes cause differences in the amount of swelling, inducing opening of the stomata in some cases and closing in others. It is considered even possible that these physical movements may play a certain role in the movements of stomata in vivo. A bibliography of 28 titles is included.

A simple gas analysis apparatus for the measurement of plant respiration, B. N. Singh and P. B. Mathur (*Plant Physiol., 11 (1936), No. 4, pp. 881–883, figs. 2*).—"The principle of the apparatus consists, in brief, in measuring the pressures exercised by the various constituents of a gaseous mixture. As the partial pressure of a component is proportional to its concentration in the gaseous sample and the sum of the various partial pressures is equal to the total pressure exerted by the gas sample, the percentage content of the component, say x, is easily calculated: $x=h \times 100/H_o$ where $h=$ the partial pressure of the component under consideration, and $H_o=$ atmospheric pressure in mm Hg."

GENETICS

Cytological phenomena connected with self-sterility in the flowering plants, E. R. Sears (*Genetics, 22 (1937), No. 1, pp. 130–181, pls. 2, figs. 4*).—In this contribution by the U. S. Department of Agriculture and the Missouri Experiment Station, it is stated that "self-sterility in all higher plants thus far investigated bears interpretation on the basis of a reaction of the immune type between the male gametophyte and diploid female tissue. Differences in behavior of the male gametophyte depend on localization of this reaction in different parts of the pistil.

"The present investigation permits the following classification according to when the incompatibility reaction occurs: (1) Before the pollen germinates, (2) while the pollen tube is growing in the style, and (3) when the tube reaches the ovule." Group 1 (*Brassica oleracea italica, Raphanus sativus, Pelargonium hortorum*, and *Secale cereale*) represents a tendency toward localization of the incompatibility reaction in the stigma, accompanied by a lack of the stigmatic fluid. In group 2 (*Petunia violacea, Abutilon hybridum, Nicotiana sanderae, Linaria reticulata, Nemesia strumosa*, and *Tolmiea menziesii*), the reaction occurs in the stigma or in various parts of the style. In group 3 (*Gasteria*), the integuments of the ovule are concerned in the reaction, which prevents the incompatible tube from stimulating them to development.

"The following general conclusions may be drawn: (1) Self-incompatibility of the *Gasteria* type is rare in the plant kingdom, (2) incompatible pollen of crucifers tends to be inhibited on the stigma, (3) self-sterility in animals has a physiological basis similar to that in the higher plants, and (4) self-sterility in fungi perhaps depends on a reaction of the same immune type as assumed for animals and the higher plants."

A bibliography is provided.

Maternal inheritance in barley, D. W. Robertson (*Genetics, 22 (1937), No. 1, pp. 104–113, figs. 6*).—The occurrence of maternal inheritance in a chlorina (solid color) plant obtained from Coast barley (*Hordeum vulgare*) is described from studies at the Colorado Experiment Station. See also earlier notes (E. S. R., 69, p. 344).

Coast V is a pale green chlorophyll-deficient plant, the chlorina color being the absinthe green of Ridgway (E. S. R., 29, p. 762). When Coast V was used as a female parent in crosses with other barleys the F_1, F_2, and F_3 were all chlorophyll deficient like Coast V, indicating maternal inheritance of the chlorina plant color. In crosses in which Coast V served as the male parent the F_1 was normal green. In later generations the Coast V chlorina color did not appear or segregate out when Coast V was used as the male parent, indicating that the pollen does not carry a factor for Coast V chlorina. Factor pairs located in all seven linkage groups gave simple Mendelian segregations in both chlorina (Coast V) and normal green families (reciprocal crosses). Three generations of backcrossing to normal green did not change the Coast V parental color. Inoculation with extracts from Coast V chlorina seedlings had no apparent effect on the color of normal plants. Pedigree breeding showed Coast V chlorina to be constant for eight generations.

The effect of varying gene dosage on aleurone colour in maize, M. M. Rhoades (*Jour. Genet., 33 (1936), No. 3, pp. 347–354, fig. 1*).—A new dominant gene *Dt*, according to Iowa Experiment Station studies in cooperation with the U. S. Department of Agriculture, interacts with recessive a_1 in the presence of the dominant allels of the other factors concerned with aleurone color of corn to give colored dots scattered over the aleurone layer. *Dt* is specific in its interaction with recessive a_1. The effect on the dotted character of varying the dosage of recessive a_1 was additive and of varying the dosage of the *Dt* gene was nonadditive.

Note on the origin of triploidy in maize, M. M. Rhoades (*Jour. Genet., 33 (1936), No. 3, pp. 355–357*).—In further cooperative studies, while triploid individuals in corn usually have occurred through fertilization of diploid or unreduced eggs by haploid sperm the case of triploidy described is shown to have arisen when the diploid number of chromosomes was contributed by the male parent.

Effect of luteus genes on longevity of seed in maize, M. G. Weiss and J. B. Wentz (*Jour. Amer. Soc. Agron., 29 (1937), No. 1, pp. 63–75*).—Two genes in corn, both located on chromosome 10, were found at the Iowa Experiment Station to be associated closely with longevity of seed. There was evidence that the viability of seeds homozygous for the luteus $_2$ and luteus $_4$ genes was definitely decreased during dormancy. Progenies segregating about 25 percent of luteus seedlings soon after harvest dropped to about 1 percent of luteus seedlings after 2 yr. of dormancy. No decrease in viability of seeds homozygous for luteus $_1$, luteus $_5$, luteus $_6$, or luteus $_8$ was observed. Seedlings from old seeds homozygous for the luteus $_2$ and luteus $_4$ genes were also reduced greatly in vigor.

Further studies of mutations of the Porto Rico sweet potato, J. C. Miller (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 460–465, figs. 2*).—Four mutants derived from the Porto Rico variety are compared with the parent in studies at the Louisiana Experiment Station, as to characteristics, chemical composition, and yield. A mutant induced by X-ray treatment resembled one of the natural mutants.

Inheritance studies of several qualitative and quantitative characters in spring wheat crosses between varieties relatively susceptible and resistant to drought, J. H. Torrie (*Canad. Jour. Res., 14 (1936), No. 10, Sect. C, pp. 368–385, fig. 1*).—In genetic studies at the University of Alberta made in the F_2 and F_3 of three wheat crosses, glume color was found to be controlled by either one or two factor pairs in Selection I-28-60 × Milturum, and by two factor pairs in Reward × Caesium and Caesium × Marquis. Awning, straw color,

glume pubescence, and spike regularity were each governed by one factor pair, while three factor pairs were operative in the inheritance of seed color.

Polymeric factors seemed to control inheritance of straw strength, plant height, earliness, and grain yield. A partial dominance of strong straw and earliness was found in Reward × Caesium and Caesium × Marquis. Tallness and low grain yield were partially dominant in Reward × Caesium. Evidence for transgressive segregation of earliness was obtained in Caesium × Marquis.

Glume color, awning, straw color, glume pubescence, and spike regularity were inherited independently; white straw color and earliness were definitely associated in Reward × Caesium and Caesium × Marquis; and straw color and plant height were loosely linked in Caesium × Marquis. Grain yield was not correlated significantly with straw strength, plant height, or earliness in Reward × Caesium. Small but significant relationships were found among straw strength, plant height, and earliness in Reward × Caesium and Caesium × Marquis. In the F_4 of Reward × Caesium a strong positive correlation was obtained between heading and maturity.

The genetics of resistance to bunt (Tilletia tritici, race 5 M. A.) in the cross Barletta×Florence (Cheg 27–10x) [trans. title], R. Nieves (*Physis, 12 (1936), No. 41, pp. 51–63*).—This gives a general review, followed by the author's genetic analysis of the factors for bunt resistance in the wheat cross *Barletta* × *Florence* varieties.

Bud mutations in horticultural crops, A. D. Shamel and C. S. Pomeroy (*Jour. Heredity, 27 (1936), No. 12, pp. 486–494, figs. 2*).—This is a summary of information which the authors have compiled regarding bud mutations in fruit and potato varieties. A partial bibliography is appended.

The physiological consequences of polyploidy, I, II, A. C. Fabergé (*Jour. Genet., 33 (1936), No. 3, pp. 365–399, figs. 2*).—This study, conducted at the John Innes Horticultural Institution, is presented in two parts.

The first, growth and size in the tomato (pp. 365–382), presents evidence that tetraploids do not differ consistently from diploids in the total amount of substance produced. Although tetraploid embryos were about 30 percent heavier than diploids, this advantage was lost during the 11 days following the sowing of the seed. The tetraploids did not differ significantly from diploids in their water content.

The second paper, the effect of polyploidy on variability in the tomato (pp. 383–397), presents evidence that polyploidy results consistently in diminished variability. It is assumed that doubling of the nunmber of genes results in an increased probability of the action of quantitative factors which is reflected in a greater physiological stability of the early meristems. The fact that tetraploidy results in diminished fruit size was confirmed.

An appendix, heterogeneity of a set of variances, by W. L. Stevens, (pp. 398, 399), is included.

Reduction division, pollen lethality, and polyploidy in apples, O. Heilborn (*Acta Horti Bergiani [Uppsala], 11 (1935), No. 7, pp. 129–184, figs. 10*).—Observations on 181 apple varieties showed 148 to be diploids and 33 triploids. In general, the diploids yielded good pollen and the triploids inferior pollen. The author suggests that the triploid apples are secondary autotriploids. A strong correlation was observed between triploid chromosomes and keeping quality. In a collection of 65 apple varieties all 12 triploids were good winter keepers, leading to the conclusion that autotriploidy exerts an influence on keeping quality. A factorial explanation, based on recessive pollen lethals, is offered for pollen abortion in diploid apples.

New filbert hybrids, C. A. Reed (*Jour. Heredity, 27 (1936), No. 11, pp. 427–431, figs. 2*).—Discussing the general status of filbert breeding in the United States and describing some of the newer hybrids developed by various breeders, the author reviews briefly filbert breeding operations conducted by the U. S. Department of Agriculture. Seedlings obtained from crosses of foreign and American forms of *Corylus* showed greater hardiness than did the tender parents. The foliage almost invariably resembled that of the foreign parents, and the nuts in size, form, color, thinness of shell, and appearance of the kernel also favored the tender parent. Crosses in which *C. colurna* L. was used as the pollen parent yielded few viable seed, and the resulting seedlings yielded nuts which were for the most part without kernels.

The position of genetic investigations with cattle [trans. title], C. von Patow (*Züchtungskunde, 11 (1936), No. 9, pp. 343–355*).—A brief popular review is given of present knowledge about the inheritance of color and markings, morphological characteristics, milk, butterfat, and meat production, lethal factors, and other characters in cattle.

Congenital hairlessness in calves of the black-spotted lowland breed as determined by lethal factors [trans. title], F. Eiskle (*Züchtungskunde, 11 (1936), No. 11, pp. 432–437*).—Among 25 calves with different dams and sired by the same bull, 5 were hairless. Histological study of the hide showed a thickened epidermis with the absence of sweat glands. The hairless calves were produced by cows having the same sire when mated to a half-brother of their sire. There was also other inbreeding in the pedigrees. The condition was considered due to the operation of a single pair of recessive genes.

Syndactyly in swine and further results on the inheritance of color in swine [trans. title], C. Kosswig and H. P. Ossent (*Züchter, 8 (1936), No. 12, pp. 324–329, figs. 5*).—F_2 and backcross data are presented to confirm the inheritance of syndactyly in swine as due to the operation of a single dominant gene. An explanation of certain modifying factors in color inheritance is also presented.

A study of mutations in evolution.—III, The evolution of the equine foot, R. C. Robb (*Jour. Genet., 33 (1936), No. 2, pp. 267–273, figs. 2*).—Continuing this series (E. S. R., 74, p. 325), measurements of one fore- and one hind-foot of 19 prehistoric and modern one-, three-, and four-toed horses suggested that the evolution from 4 to 3 toes was continuous, but that from 3 to 1 toe was discontinuous and required the intervention of a specific form mutation.

Inheritance of tail tip pigmentation in the house mouse, H. Grüneberg (*Jour. Genet., 33 (1936), No. 2, pp. 343–345*).—The inheritance of tail tip pigmentation was studied in the house mouse by crossing two strains, one of which had dark tail tip and the other of which had pink tail tips in about 78 percent of the animals. Of the 27 F_1s, 26 had dark tails and 1 a white tip. The backcross and F_2 populations suggested that the character was due to a single gene difference with dark tail dominant but not completely so.

An inherited tremor in Peromyscus, R. R. Huestis and E. Barto (*Jour. Heredity, 27 (1936), No. 11, pp. 436–438, fig. 1*).—A trembling condition associated with small size and heavy early mortality is described in the deer mouse. No affected animals produced young, but among the young produced by carriers there were 55 without tremors and 12 with tremors. This suggested a single pair of Mendelian factors responsible for the tremor character. The heavy mortality before trembling is exhibited in the young at over two weeks of age presumably accounted for the deficiency of the tremor class.

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Studies on the creeper fowl.—X, A study of the mode of action of a lethal factor by explantation methods, P. R. David (*Arch. Entwickl. Mech. Organ., 135 (1936), No. 3, pp. 521–551, figs. 6; Ger. abs., pp. 548, 549*).—Continuing this series from the [Connecticut] Storrs Experiment Station (E. S. R., 73, p. 458), study was made of the lethal mechanism of the creeper gene by comparing the behavior of tissues from homozygous creeper and normal birds in culture. Fragments of heart tissue from *CpCp* embryos were markedly inferior in their growth rate to similar fragments from normal embryos. The difference in the growth of other tissues from normal and creeper embryos was much less, if not negligible. Tissues from retarded non-*CpCp* embryos behaved in tissue culture much as tissue from *CpCp* embryos. In experiments in which tissues from 72- to 82-hr. embryos were grafted on the chorio-allantoic membranes of 8- to 9-day embryos, the fragments from the abnormal embryos evidently had the same capacity to survive and grow as those from the normal embryos except in the case of the limb cartilage. It is concluded that the death of homozygous creeper embryos before hatching is probably due to the dislocation of normal morphogenetic correlations on account of the disproportionate reaction of different developmental processes to the general retardation.

Genetical differences in eight-week weight and feathering, R. G. Jaap and L. Morris (*Poultry Sci., 16 (1937), No. 1, pp. 44–48*).—Data are presented on the degree of feathering and weights at 8 weeks of age of birds hatched at the Oklahoma Experiment Station in the spring of 1936. The data differed from the findings of Schnetzler (E. S. R., 76, p. 464), Asmundson and Lerner (E. S. R., 70, p. 462), and others by showing that the 8-week weight of White Leghorns was greater than that of Barred and White Plymouth Rocks but less than that of Buff Orpingtons, White Wyandottes, and Rhode Island Reds. These results indicate that the first 8 weeks' growth is not necessarily associated with mature weight.

A statistical analysis of the total variance in 8-week weights indicated that 13 percent might be attributed to variety, 19 percent to sire, 27 percent to dam, and 23 percent to sex, with the residual of 18 percent due to several other conditions. Feathering was related to the 8-week weight, but 49 percent of the variance was not heritable. By selecting poorly feathered animals, strains of poor feathering were produced in Rhode Island Reds but selection for rapid feathering was less effective. Crosses of White Rocks and Buff Orpingtons increased the 8-week weight to that of the more rapidly growing parents.

The basis for differences in body size in fowls [trans. title], L. Kaufman (*Arch. Geflügelk., 10 (1936), No. 10, pp. 374–377; Eng. abs., p. 377*).—Study of the embryonic development of Bantam eggs in comparison with the eggs of normal fowls and crosses between them showed that the early development was the same, but by 11 days of incubation, size differences in the embryos were evident even though the eggs were of the same size. Bantam embryos hatched about one day earlier.

Development of fertility in young Barred Plymouth Rock males, R. L. Hogue and E. E. Schnetzler (*Poultry Sci., 16 (1937), No. 1, pp. 62–67, figs. 8*).—In studying the age at which young Barred Plymouth Rock cockerels attained sexual maturity at the Indiana Experiment Station, birds were sacrificed at 2-week intervals up to 20 weeks of age. Histological study showed the presence of mature sperm in the testes at 20 weeks of age. In individual matings with mature hens, some cockerels could fertilize the eggs at 16 weeks of age although others did not produce fertile eggs until 32 weeks of age. In pen matings, the age at producing fertile eggs varied from 21 to 30 weeks.

The early determination of pregnancy by the blood and urine of domestic nimals [trans. title], D. Küst (*Züchtungskunde, 11 (1936), No. 11, pp. 417–22*).—Biological tests for pregnancy give positive results sufficiently early to e useful only in the human (urine) and the mare (serum).

The cells of the adrenal cortex of the ewe during the estrual cycle and regnancy, L. J. Nahm and F. F. McKenzie (*Missouri Sta. Res. Bul. 251 (1937), p. 20, figs. 13*).—Study is reported of the changes in the histology of the adrenals ccurring during oestrus and pregnancy in the ewe. Based on observation of he adrenal cortex from 49 ewes, an increase in the percentage of dark-type ells associated with increased amounts of lipoids was noted in early oestrus nd early and late pregnancy. The fluctuating number of chondriosomes uggested their transitory nature and association with the production of secretion and other reserve material.

Influence of suckling upon galactin content of the rat pituitary, R. P. Reece and C. W. Turner (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 3, pp. 367, 368*).—Assays at the Missouri Experiment Station of the pituitary glands of lactating female rats showed that those not permitted to suckle young for 15 hr. had a much higher galactin content, 9.20 bird units, than those which suckled young during the last 3 hr. of the 15-hr. period, 3.06 bird units. Evidently the removal of milk from the mammary gland stimulates the removal of galactin from the hypophysis.

The adrenotropic principle of the pituitary in relation to lactation, E. T. Gomez and C. W. Turner (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 1, pp. 78–80*).—In experiments with guinea pigs at the Missouri Experiment Station in continuation of the studies noted above, lactation was initiated in males and females even following the removal of the hypophysis by the administration of galactin and the adreno-cortico-tropic hormone extract from sheep pituitary, and lactation was maintained in lactating guinea pigs from 8 to 15 days following hypophysectomy. It is considered that the lactogenic, adrenotropic, and probably the carbohydrate metabolism hormones of the pituitary are necessary for continued lactation.

Initiation and maintenance of lactation in hypophysectomized guinea pigs, E. T. Gomez and C. W. Turner (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 3, pp. 365–367*).—In studies at the Missouri Experiment Station, it was found possible to initiate lactation in hypophysectomized guinea pigs by the administration of lactogenic hormone and adrenal cortical hormone with glucose. However, under these conditions involution of the mammary gland was only slightly, if at all, prevented.

Heterogony of the glutathione content of new-born rabbits, I. M. Lerner, P. W. Gregory, and H. Goss (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 2, pp. 283–285*).—Further statistical analysis of the data of Gregory et al. on the relation of glutathione content of newborn rabbits to adult weight (E. S. R., 76, p. 322) led to the conclusion that each breed has its characteristic glutathione content as well as a characteristic rate of change in this factor correlated with adult size.

Time factor relationship of follicle stimulation and luteinization in the immature rat, R. T. Frank and U. J. Salmon (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 3, pp. 493–495*).—Studies were made of the rapidity of response of the ovaries of immature rats to four injections of castrate urine, whole pregnancy urine, and extracts of the anterior hypophysis (maturity factor) and anterior lobe hormone. The rats' ovaries were examined at operation or autopsy from 26 to 144 hr. after the first injection. It appears that some ovaries respond as early as 26 hr. to gonadotropic hormone with a follicle-

stimulating reaction which becomes progressively more pronounced up to 64 to 72 hr. This is followed by luteinization reaching a maximum at 96 hr. Luteinization is influenced by the method of extraction, the quantity of extract administered, and the time after injection.

The collection of spermatozoa from the domestic fowl and turkey, W. H. BURROWS and J. P. QUINN (*Poultry Sci., 16 (1937), No. 1, pp. 19–24, figs. 4*).—Modifications in the method (E. S. R., 73, p. 671) for collecting semen from the domestic fowl are suggested which permit collections from turkeys and less responsive male fowls with greater ease of stimulation, less soiling of the material obtained, and milking semen from the ducts. Twenty-two birds yielded 2,372 cc of semen from November 8 to June 1.

FIELD CROPS

[Field crops work in Delaware], G. L. SCHUSTER and C. E. PHILLIPS (*Delaware Sta. Bul. 205 (1936), pp. 14–18*).—Fertilizer and breeding experiments with wheat, pasture improvement, fertility rotation experiments, and trials of barley varieties are reported on briefly.

[Farm crops investigations in Iowa], F. S. WILKINS, H. D. HUGHES, P. E. BROWN, L. C. BURNETT, J. B. WENTZ, C. Y. CANNON, J. L. ROBINSON, E. V. COLLINS, J. N. MARTIN, E. L. ERICKSON, H. C. MURPHY, P. M. NELSON, J. L. BOATMAN, L. W. FORMAN, R. H. WALKER, R. H. PORTER, E. O. BROWN, W. J. HENDERSON, C. S. REDDY, I. E. MELHUS, W. F. BUCHHOLTZ, C. M. NAGEL, A. L. BAKKE, W. E. LOOMIS, W. G. GAESSLER, A. T. ERWIN, E. S. HABER, N. D. MORGAN, H. GIESE, R. M. HIXON, C. K. SHEDD, J. B. DAVIDSON, G. N. DAVIS, M. M. RHOADES, A. A. BRYAN, R. W. JUGENHEIMER, J. C. ELDREDGE, E. W. LINDSTROM, and J. M. AIKMAN (*Iowa Sta. Rpt. 1936, pts. 1, pp. 51–61, 62, 83, 104, 105, 108, 110, 111, 112, 113, 168, 169, 171, 172, 174, fig. 1; 2, pp. 24–35, 35–37, 38–41, 42–44, 49, figs. 6*).—Progress (E. S. R., 75, p. 35) is again reviewed briefly in part 1 for breeding work with oats, barley, wheat, soybeans, sugar beets, potatoes, and sweetpotatoes; variety tests with oats, wheat, barley, alfalfa, red clover (strains), sweetclover, sugar beets, soybeans, edible soybeans, sweetpotatoes, and sorgo; trials of legumes and grasses for hay and pasture; variety-cultural experiments with oats and wheat; cultural studies with reed canary grass, sugar beets, and with alfalfa on bacterial wilt-infected soil; fertilizer and green manure tests for sweetpotatoes; the effect on alfalfa of spring-burning natural mulch material; cytology and physiology of winter hardiness in biennial white sweetclover and alfalfa; effect of cutting red and alsike clovers at different times; technic for determining water content of green forage; trials of legumes for green manure; tests of commercial cultures for the inoculation of legumes and nonlegumes; varietal and fertilizer factors affecting the storage quality of sweetpotatoes; studies of sugar production in sugar beets; propagation tests with sweetpotatoes; permanent pasture improvement; effects of fertilizing materials and methods of grazing on soil conditions and plant growth on permanent pastures; study of seed coat structure and environmental factors affecting germination of weed seeds; investigations of impermeability, longevity, dormancy, viability, and germination of seeds; eradication of biennial sweetclover by cultivation; properties and herbicidal action of furfural and its emulsions and of sodium chlorate mixtures; physiology and life history of European bindweed; and storage and translocation in dandelions.

Investigations proceeding as projects under the Iowa Corn Research Institute, covered in part 2, dealt with genetic relations of inbred lines; genetic studies; improving inbred lines by crossing followed by selfing and sibbing;

comparison of inbred lines obtained from open-pollinated varieties and from F_1 crosses between inbred lines; improvement through the use of inbred lines; kernel characteristics of seed corn in relation to yield; growth response of corn hybrids and varieties on soils of different levels of fertility and on various soil types; relation of time of planting to yield and quality of product among crosses between inbred lines of corn; the measurement of limiting environmental factors in the growth of the plant at different rates and spacings; correlation between composition and strength of stalk; comparative study of the stem and root development of some of the varieties of field corn grown in Iowa; trials of planting methods; tests of varieties, strains, and hybrid combinations in different parts of Iowa; curing and storage studies; the relation of grades of whole and shredded corn fodder and stover to methods of curing, storing, and baling; maintenance of pure seed sources of improved varieties through field inspection and certification; the production and distribution of seed of corn hybrids and of the parents from which they are derived; and breeding and cultural studies with popcorn. Other activities reported on as related to corn production included seed increase of new or improved varieties of field crops; technics used in seed analysis; methods of destroying localized areas of noxious weeds, particularly European bindweed and leafy spurge; physiology of field bindweed (*Convolvulus arvensis* L.) and other noxious weeds; and weed control in growing corn.

Several of the projects were in cooperation with the U. S. Department of Agriculture.

Biennial report of the Northeast Louisiana Experiment Station, St. Joseph, Louisiana, 1935–1936, C. B. Haddon (*Louisiana Sta., Northeast Louisiana Sta. Bien. Rpt. 1935–36, pp. 12*).—Field crops experiments reported on comprised variety tests, fertilizer experiments, including carriers of nitrogen and potassium and rates of mixed fertilizer, production after different legume winter cover crops and after vetch turned under on several dates, yields following corn and soybeans, and spacing tests, all with cotton; and variety and spacing tests and comparisons of nitrogen sources for top dressing, all with corn.

[***Crops experiments at the North Louisiana Substation***], S. Stewart and R. E. Wright (*Louisiana Sta., North Louisiana Sta. Bien. Rpt. 1935–36, pp. 2–16, 17, 18, 19, 20*).—Average results are again reported from experiments during several years with field crops at Calhoun (E. S. R., 75, p. 474), including variety tests with cotton, corn, oats, cowpeas, soybeans, crotalaria, sugarcane for sirup, grain sorghum, potatoes, and sweetpotatoes; fertilizer trials with cotton, corn, oats, potatoes, and sweetpotatoes; seedbed preparation and planting tests with cotton and corn; comparisons of winter cover crops for cotton and corn; corn variously spaced and interplanted with soybeans; grazing, spacing and cost of production for dairy feed tests with sweetpotatoes; a manured and fertilized rotation; and a production test with alfalfa.

[**Field crops experiments in New Mexico**] (*New Mexico Sta. Rpt. 1936, pp 17–34, 36, 37, 38, 39, 40, 44, 45, 55, 58, 59, 62, 63*).—Agronomic research (E. S. R., 75, p. 36), reported on briefly from the station and from outlying fields, included variety tests with winter- and spring-sown wheat, oats, and barley, corn, grain sorghum, sorgo, millet, cotton, potatoes, sugar beets, alfalfa, soybeans, cowpeas, beans, and miscellaneous forage crops; breeding work with cotton and pinto beans; cultural (including planting) tests with hegari, sesbania, and sweetpotatoes; fertilizer experiments with cotton and potatoes; seed treatment and irrigation tests with cotton; studies of the annual production of sugar beet seed, concerned principally with effects of preceding crops, plant-

ing methods, and application of various fertilizers and manure; studies of varietal resistance to the curly top disease of sugar beets; determination of the grades and staple of New Mexico cotton; studies of the revegetation of southwestern ranges by controlled grazing, utilization of run-off water, and reseeding; and control of Johnson grass by cultural methods, chlorates, and burning. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[Field crop investigations at the United States Dry-Land Field Station, Ardmore, S. Dak., 1911–32], O. R. MATHEWS and V. I. CLARK (*U. S. Dept. Agr. Circ. 421 (1937), pp. 4–38*).—The agronomic research reported, with suggestions for farm practice, supplemented that described earlier for 1912–25 (E. S. R., 58, p. 324). The relative merits of summer fallow and other crop production methods also have been reported (E. S. R., 67, p. 124). Experiments on crop rotations and cultural methods included comparisons of spring and fall plowing, subsoiling, and listing for seven crops and their yields under alternate fallow and crop v. continuous culture; methods of preparing cornland and disking v. plowing grain stubble for small grains; yields of small grain, corn, and sorgo in different sequences; effects of sod crops on yields of succeeding crops; and crop yields on manured v. unmanured fallow and on fallow v. following green manure. Field scale trials compared field yields v. average yields from rotations; corn v. sorgo as preparations for wheat and oats; and crop yields in the 4-yr. rotation of sorgo, corn, oats, and manured fallow. Other activities included variety tests with common and durum spring wheat, oats, barley, corn for grain and silage, millet, sorgo, and alfalfa; Dakota Amber sorgo and Sudan grass in 7-in. drills v. 42-in. rows; and production tests with bromegrass and crested wheatgrass.

Biochemical distinctions between barley varieties, J. A. SHELLENBERGER and C. H. BAILEY (*Cereal Chem., 13 (1936), No. 6, pp. 631–655, figs. 5*).—For this study by the Minnesota Experiment Station, samples of the same barley varieties were obtained from the University Farm at St. Paul for the years 1933, 1934, and 1935, and from the Crookston Substation for 1934. For a normal steeping period of about 50 hr. the variations in imbibition rates for the different varieties were small (detailed data given). The acrospire growth and diastatic activity were also compared. The diastatic activity of barley and malt was correlated when measured by the Lintner method but not by the Blish-Sandstedt method, and there was no correlation between the results of the two methods when applied to either malt or barley samples. Measured by the second method, Velvet was consistently high and Peatland low in diastatic activity, but with the Lintner method no such varietal differences were noted. Malting and drying increased the resistance of starch to taka-diastase action. There was a significant negative correlation between the diastatic activity (Blish-Sandstedt method) and starch resistance for barley, but a positive correlation existed between the Blish-Sandstedt values for green and dry malt and starch resistance. No varietal differences were found in starch resistance of barleys to enzymic action. Trebi barley was decidedly deficient in liquefying power, but on germination this became normal. The liquefying power of malt was not appreciably changed by drying, but the saccharifying power was increased. The liquefying action of barley could not be correlated with the saccharifying action of the same barleys (Lintner method).

A bibliography of 45 references is given.

The production of corn on Richfield silt loam soil, H. A. DANIEL ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 62 (1937), pp. 3–6*).—The data from vari-

etal tests 1923–36 at Goodwell, Okla., considering the number of failures compared with productive seasons, indicated that only in 1928 was corn grown economically in competition with wheat, annual legumes for hay, and sorghum. Surecropper and Brazilian Flour made the highest average yields for the 14-yr. period, but when comparisons were made between all varieties grown during the last 8 yr., 90-day Bloody Butcher, Surecropper, and Dent Squaw led in order.

Developmental morphology of the caryopsis in maize, L. F. Randolph (*Jour. Agr. Res.* [*U. S.*], *53* (*1936*), *No. 12, pp. 881–916, figs. 12*).—The morphology of the pistillate spikelet, the ovary, and the ovule in corn is described briefly from cooperative studies of U. S. D. A. Bureau of Plant Industry and the [New York] Cornell Experiment Station, and a detailed account is given of the developmental history of the caryopsis, with consideration of the time factor, temperature, and seasonal variations in relation to pollen tube growth, fertilization, and kernel development.

Following pollination the pollen tube becomes established in the silk within from 5 to 10 min., and the male gametes enter the pollen tube within from 2 to 4 hr. at a temperature of from 22° to 24° C. Fertilization occurs within 16 hr. for silk lengths of from 3 to 5 cm and within 23 hr. for silk lengths of from 15 to 18 cm under field conditions with maximum day temperatures of from 25° to 30° and minimum night temperatures of from 13° to 17°. Following fertilization the primary endosperm nucleus divides within from 2 to 4 hr. and the zygote divides within from 8 to 10 hr.

As the caryopsis develops the ovary wall is transformed into the pericarp and the ovule is displaced by the embryo and endosperm except the outer wall of the nucellar epidermis, which becomes the suberized membrance of the mature kernel. The integuments of the ovule virtually disappear in the early stages. Thus the maize caryopsis has no true seed coat. The antipodal tissue frequently persists and at times proliferates to form an extensive starch-filled tissue in the subcrown region of the kernel.

The proembryo develops irregularly in the early stage without a definite pattern of cells or sequence of cell division, and the early cleavage planes could not be identified from 8 to 10 days after pollination when the axis of the embryo proper originated in a lateral position within the proembryo. The epidermis of the proembryo is delimited from 7 to 10 days after pollination.

The differentiation of the coleoptile, seedling leaves, scutellum, and coleorhiza, as well as other details of embryo formation, was traced in a close series of developmental stages. The development of the endosperm from the free nucleate stage to maturity is described, with special reference to the manner in which growth occurs by cell division activity in the epidermal and subepidermal regions in the later stages and the epidermis of the endosperm is transformed into the aleurone layer.

The early development of the cotton fibre, F. M. L. Sheffield (*Empire Cotton Growing Rev.*, *13* (*1936*), *No. 4, pp. 277–286, pls. 4*).—Using 12 plants of the Sakel variety grown in the greenhouse, the author traced the development of the fibers from primordial cells in the epidermis. Pollination was found to stimulate cell division in the epidermal layer, and mitosis continued in the epidermis and young hairs were differentiated for a considerable time after flowering. The number of epidermal cells in active division seemed to reach a peak at about the second day, but mitosis occurred to a diminishing extent until at least 10 days after flowering.

Discrepancies in the results of previous workers are apparently due to variations in the rate of development and differentiation in different cells of the same seeds and in different seeds within the same boll.

Time factor in utilization of mineral nutrients by hemp, M. E. Tibeau (*Plant Physiol., 11 (1936), No. 4, pp. 731–747, figs. 9*).—A high potassium nutrient solution produced the tallest and most vigorous plants, with the largest and thickest leaves, while potassium deficiency caused stunted growth and copper mottling of the leaves. Plants recovered rapidly from prolonged deficiency, but failed to attain normal growth. A high magnesium nutrient did not affect growth, but a deficiency resulted in chlorosis. Recovery was slower the longer magnesium was withheld. Excess calcium retarded growth, while a deficiency induced paleness, necrotic spotting of the leaves, and early cessation of meristematic activity. Recovery was more rapid after longer periods of deficiency. A high-nitrogen nutrient produced a dark green leafy plant which failed to survive, while the absence of nitrogen resulted in stunting and a pale green color. After a short period of nitrogen starvation the plants made a rapid recovery but died soon after, while from longer periods recovery was slower. Abundance of nitrogen at the time of fruit bud differentiation led to the production of female flowers, while its absence at that time tended to the production of male flowers.

The injurious influence of enormous doses of phosphorus on oats, T. Lityński (*O ujemnym wpływie nadmiernie wysokich dawek fosforu na owies, Poznań (Posen): Dziennika Poznań., 1935, pp. 23; Eng. abs., pp. 21, 22*).—The plants in the two series received, respectively, 10 and 0.25 g of P_2O_5 per pot, given in the form of $CaHPO_4$ and as a neutral mixture of $(NH_4)H_2PO_4$ and $(NH_4)_2HPO_4$. Whitening and yellowing of the leaf margins and drying of the foliage followed the use of the larger amount, and these plants assimilated a much greater amount of phosphorus than the other series. Only a small portion taken up was converted into organic compounds, the greater part occurring in the cell sap in the mineral form. There was no significant difference in the protein and nonprotein nitrogen compounds or in the mineral content of the two series. The base: acid ratio in plants receiving the normal dosage was 2:1, while in those with the higher dosage it was 2:2. It is believed that the physiological disturbance in the latter group was due to the increased acidity of the cell juices without any increase in the soil acidity.

Nutritional levels in the peanut plant: Contributions from the Hull Botanical Laboratory, R. H. Moore (*Bot. Gaz., 98 (1937), No. 3, pp. 464–490, figs. 2*).—In this study by the Puerto Rico Experiment Station, the greatest vegetative extension and fruitfulness of the plant occurred under the same cultural treatment. All high-nitrogen plants were dark blue green, slender stemmed, and succulent, while all high-carbohydrate plants were very pale yellow green, relatively thick stemmed, and firm. Both groups were weakly vegetative and nonfruitful. From the highest nitrogen to the highest carbohydrate series the percentage of dry matter and total carbohydrates increased, and that of soluble solids and total nitrogen decreased, consistently with vegetative and reproductive responses. The root fractions increased in percentage of soluble solids. "Hemicelluloses" were not correlated with levels of nutrition. High carbohydrate conditions favored a slightly higher percentage of ether extract in seeds and gynophores, a suppression of rancidity in the seeds, and development of marginal hairs on the leaflets. Gynophore development was precocious. The mode of the flower-to-gynophore interval was influenced only slightly by enlargement of the fruits on older gynophores or by extensive variations in metabolic levels, but elongation of the gynophores was abruptly inhibited by extreme levels of nutrition. The fruiting tendency was less sensitive to nutritional change than in tomatoes. When grown in the light, the concentration of the phosphate ion in nutrient solutions must be greatly reduced to obviate

injury. Ammonium nitrogen nutrient solutions not precipitating when applied at pH 7.1 are reported, and a method for determining nitrates by a 6-hr. aeration period is described. A bibliography of 25 references is included.

Soil and plant response to certain methods of potato cultivation, G. C. Moore (*[New York] Cornell Sta. Bul. 662 (1937), pp. 48, figs. 20*).—In studies at Ithaca, N. Y., with Smooth Rural potatoes grown on Dunkirk silty clay loam for 3 yr. and on Dunkirk gravelly sandy loam for 1 yr., comparisons were made of deep v. shallow planting followed by both deep and shallow covering of the seed piece, level moderate ridging v. extreme ridging methods as to effects of scraping v. cultivation, side dressing with nitrates v. initial fertilizer application only, and of irrigation v. rainfall on soil and plant response.

Emergence was hastened by deep planting from 2 to 3 days over shallow planting and by an additional 2 to 3 days by covering the seed pieces shallow, but final stands were about the same. Yield differences did not follow deep and shallow covering at either planting depth. Soil moisture in the first 12 in. of soil decreased with increasing height of ridge, the rate of loss being most rapid in ridge and least in level culture. Cultivation conserved a small amount of moisture as compared with scraping. Soil nitrates, especially following tuber set, were higher in ridges than in level soil but did not differ when scraping was compared with cultivation. Soil temperature at the seed piece level averaged about 1° F. lower in level than in ridge culture over a 24-hr. period, bearing an inverse relationship to soil moisture. Scraping seemed to favor a higher temperatune in level soil but a lower one in 4-in. ridges.

Roots were much more fibrous in ridged soil than in level culture, but their depth of penetration was not materially different. Pruning by cultivation was less in ridged plats because of the more vertical direction of the roots. Tuber shape was not influenced by cultural treatment; yields were greatest on level culture, decreasing with increasing height of ridge; while sunburning and number of tubers per plant were decreased by ridging. High positive correlation between soil moisture and tuber yield indicated that moisture accounted largely for the yield differences between cultural treatments. Irrigation in addition to rainfall eliminated differences between these treatments, being most beneficial on the higher ridges and least on level culture. Soil nitrates, comparatively high in the growing season following tuber set, tended to reduce yields slightly. Root pruning alone accounted for considerable yield reductions, mostly owing to a reduction in spread and depth of penetration of the root systems of the plant which is, in turn, manifested by a reduction in size of top. Difference in maturity due to treatment was not observed.

Practical advantages of the furrow-planting shallow-covering method of culture under New York conditions are indicated, with suggestions for ridging where necessary and for cultivation with either type of culture.

Influence of the chloride ion on the content of carbohydrates in potato leaves, S. S. Baslavskaja (*Plant Physiol., 11 (1936), No. 4, pp. 863–871, figs. 3*).—It is concluded from this study that large doses of chlorides decrease the total carbohydrates of the leaves. This is obviously correlated with a lowered chlorophyll content per unit of leaf area and a weakened photosynthetic activity. The leaves of plants of the chlorine series were relatively richer in starch than those of the controls, a phenomenon as yet unexplained.

Commercial agricultural seeds, 1936, G. P. Steinbauer (*Maine Sta. Off. Insp. 162 (1936), pp. 120–135*).—The purity, weed seed content, germination, and in the case of legumes the hard seed percentage are tabulated for 99 samples of agricultural seed collected from dealers in Maine in 1936.

HORTICULTURE

New approaches to edaphic and nutritional problems with horticultural plants, H. H. Zimmerley (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 707-719*).—In discussing the present trends in research relating to soil and nutritional problems with horticultural crops, the author reviews recent work on soil reaction, rapid chemical tests of nutrient needs based on plant sap and on the soil itself, effective placement of fertilizers, etc. He emphasizes the desirability of the horticulturist working with the soil technologist, the agricultural chemist, and the agricultural engineer.

[Horticultural studies by the Delaware Station] (*Delaware Sta. Bul. 205 (1936), pp. 34-36*).—Information is presented on physiological dropping of fruits as related to curculio sting injury and growth of peach fruits, both by L. R. Detjen and E. W. Greve; and variation in the growth of apple trees on their own and on seedling roots, by F. S. Lagassé.

[Vegetable and flower studies by the Iowa Station] [*Iowa Sta. Rpt. 1936, pts. 1, pp. 146, 158, 169, 170-172, 173; 2, pp. 37, 38, 41, 42, figs. 2*).—Brief reports are presented in part 1 on inheritance in the tomato, by E. W. Lindstrom; culture of asparagus, by A. T. Erwin and E. S. Haber; fertilizer and green manure for muskmelons, and substitute crops for cabbage and melon "sick" soils of southeastern Iowa, both by Erwin; factors affecting the quality and marketing of cantaloups, by Erwin and G. S. Shepherd; varieties of tomatoes and beans, by Erwin and Haber; varieties of muskmelons, by Erwin and N. D. Morgan; influence of temperature and moisture on growth of asparagus, by Haber; and varieties of peony and iris, by E. C. Volz. In part 2 brief mention is made of the progress of experiments in sweet corn breeding and on nature of drought resistance in inbred and hybrid lines of sweet corn, both by Haber.

[Horticulture at the North Louisiana Substation], R. E. Wright (*Louisiana Sta., North Louisiana Sta. Bien. Rpt. 1935-36, pp. 16, 17, 18, 19, 20, 21*).—The results are presented briefly of varietal, cultural, and fertilizer tests with watermelons and tomatoes; variety trials with pecans, apples, peaches, and muscadine grapes; and a production test with tung oil.

[Horticultural studies conducted by the New Mexico Station] (*New Mexico Sta. Rpt. 1936, pp. 53-55, 56, 57, 59-61, 63-65, fig. 1*).—Among investigations, the progress of which is discussed, are phenological investigations with fruits and nuts, variety tests of fruits, orchard heating, time of planting head lettuce, varieties of pecans, varieties of sweet peas, narcissus, tulips, hyacinths, gladioli, and dahlias, varieties of raspberries, fertilizer and irrigation studies with onions, vegetable seed production, and effect of fertilizers and frequency of irrigation on yield and quality of the early Grano onion.

Insecticides and fungicides, 1936, E. R. Tobey (*Maine Sta. Off. Insp. 162 (1936), pp. 136-142*).—The results are presented of analyses of 56 samples of insecticidal and fungicidal materials.

Wax emulsions for spraying nursery stock and other plant materials.—A preliminary report, E. J. Miller, J. A. Neilson, and S. L. Bandemer (*Michigan Sta. Spec. Bul. 282 (1937), pp. 39, figs. 4*).—Based on 5 years' studies on the development and use of wax emulsions that may be sprayed on plants to produce protective films, the authors conclude that the results, although still incomplete, suggest the usefulness of the emulsions for reducing desiccation in nursery stock and other plant material. In only two cases, that of small 1-yr. seedlings of larch and red spruce, did the application of the standard emulsions cause appreciable injury and even in this case the poor results are believed due to some fault in the preparation of the materials. The rela-

tion of soil moisture to successful use of emulsions is pointed out, the greatest benefits coming where soil moisture is below optimum quantity, but for dormant deciduous and coniferous plants, for the protection of tree trunks against sun scald, coating of scion wood, scale and borer control, Christmas tree spraying, and the protection of conifers from winter injury, two applications of the emulsion containing 13.8 percent of solids are considered desirable. This concentration represents approximately the maximum that can be employed satisfactorily with most equipment at working temperatures which must be above 32° F. For spraying seedling annuals and perennials, the authors suggest dilution of the emulsion with 2–5 times its volume of water. Some information is included on the use of the emulsion on apples in storage.

Experiments on electric, coal, gas, kerosene, and manure-heated hotbeds, G. J. Stout, W. B. Mack, J. E. Nicholas, and D. C. Sprague (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 605–609*).—In this further contribution (E. S. R., 72, p. 770) from the Pennsylvania Experiment Station, the authors present more of the technical features of the investigation. Reports on plant growth for two growing seasons showed quicker germination and earlier appearance of the seedlings when the source of heat was below the soil surface. Manure-heated beds produced plants of more stocky growth, and in the case of the tomato the plants weighed nearly twice as much each as from any other treatment at the time of lifting for field planting.

Home vegetable gardening in Kansas, W. B. Balch, (*Kansas Sta. Circ. 181 (1937), pp. 45, figs. 17*).—General information is presented on planning the garden, preparing the soil, fertilizers, planting, specific cultural requirements of the different vegetables, control of pests, storage, etc.

The effect of temperature, humidity and wind velocity on blossom drop of garden beans, H. J. Thomson (*[Oklahoma] Panhandle Sta., Panhandle Bul. 62 (1937), pp. 7–16, fig. 1*).—Samples of blooms collected at repeated dates in 1936 from Burpee Stringless Greenpod plants sown June 29 and watered at from 6- to 11-day intervals throughout their lives all showed abundant pollination. The abortion of flowers was due apparently to low pollen germination and slow tube growth under conditions of high temperature. Although the tender flower organisms were protected by the keel, the stigma and style were dried by excessive transpiration due to low relative humidity. Wind had a twofold effect on blossom drop—(1) direct injury by physical force, and (2) injury by drying.

Relation of plot size and shape to variability of carrot yields on peat soils, T. M. Currence (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 484–488, fig. 1*).—Using Fisher's analysis of variance, it was found in this study by the Minnesota Experiment Station upon yield data taken in a uniform block of carrots located on a peat bog, that six replications of a single row plat, three rods long, would provide a satisfactory measurement of yield variation to bring out a significance of 10 percent. The single row, three-rod plats showed practically as small variation as any arrangement and were of a convenient shape and size for study. Increasing the length of row was more effective in reducing error than was widening the plat. Considerable soil heterogeneity was indicated despite the uniform appearance of the field.

A study of the rest period of chives, J. P. McCollum (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 491–495, figs. 2*).—Stating that about October 1 (dependent on prevailing weather) chives enter a 3-mo. rest period during which growth is very slow and irregular, the author discusses experiments conducted by the Illinois Experiment Station to overcome this condition. Neither shading in the field from September 16 to October 23 nor topping had any beneficial

effect and, in fact, decreased vigor. Removal of plants to a warm greenhouse on September 16 prevented their entering into rest, but the most successful practice was the exposure of plants taken from the field after they had entered the rest period to a temperature of 110° F. for 48 hr.

New hybrid sweet corns, W. D. Enzie (*Farm Res. [New York State Sta.], 3 (1937), No. 3, pp. 7, 8*).—Brief descriptions are presented of the more promising varieties recorded in 1936, trials of 32 varieties of yellow hybrid inbreds, top crosses, and open-pollinated sorts, and of 6 white hybrids and top crosses.

New sweet corns resistant to earworm, C. F. Poole (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 496–501*).—At the California Experiment Station, Davis, five varieties, Honey June, Surcropper Sugar, Oregon Evergreen, Alameda, and Purdue Bantam, of different maturing seasons and possessing different degrees of resistance to earworm, were planted (1) all on one day and (2) at intervals to insure concurrent silking. Records of earworm injury showed the varieties to follow practically the same order of susceptibility in both plantings, indicating that the different degrees of resistance were not caused by differences in time that silks appeared but rather to inherent differences in the varieties. Crosses between the resistant varieties Honey June and Surcropper Sugar and comparatively susceptible varieties such as Golden Bantam, Alameda, Oregon Evergreen, Golden Sunshine, and Early Golden and backcrosses of F_1 seedlings to both parents yielded evidence that insect resistance is heritable. In three cases, hybrids were possibly superior to both parents in their resistance.

Variety tests of sweet corn and its resistance to corn earworm and smut injury, E. F. Burk, C. B. Cross, and E. Hixson (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 502–504*).—Observations by the Oklahoma Experiment Station on 39 varieties and strains of sweet and other corns harvested in the roasting ear stage showed a rather marked relationship between tightness of the husk and freedom from corn earworm injury. Varieties classified as tight husked had 67.3 percent marketable ears with few severely damaged, while those with loose husks had only 49.9 percent marketable ears and a relatively high percentage of badly injured ears. Smut was abundant, particularly in plants grown from southern seed.

Further studies of earworm damage in sweet corn varieties in Texas, L. R. Hawthorn (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 505–507*).—Repeating the work of 1933 (E. S. R., 72, p. 329) with the addition of several new varieties recently developed by various experiment stations, it was observed that although the infestation was more severe in 1935 as judged by percentage of infested ears the varieties taken as a whole were injured less than in 1933. The author attributes this favorable situation to the fact that the varieties in 1935 were on the whole definitely more resistant to the earworm. The five most resistant varieties in descending order were Georgia 439, Honey June No. 1, Georgia 428, Mexican June, and Honey June No. 2. The least resistant variety of the entire twenty tested was Hopeland, with only 42.9 percent marketable ears as compared with 89.1 percent in Georgia 439.

Bulb formation in some American and European varieties of onions as affected by length of day, R. Magruder and H. A. Allard (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 489, 490*).—A large number of varieties of onions were grown at Arlington Farm, Virginia, under normal light intensity but with its duration regulated, in the summers of 1934 and 1935. In 1935, two lots were supplied electric light in addition to daylight to lengthen the photoperiod to 16 and 18 hr. Increasing the length of the photoperiod hastened maturity in all varieties, but considerable variation was shown in the

minimum period required for bulb formation and in the rate and uniformity of bulb formation at superminimal photoperiods. Yellow Bermuda was the only onion to produce any good bulbs with 10 hr. light. Data are given on the minimum number of hours of light required to produce 100 percent of normal bulbs in the various varieties and strains. The value of the photoperiod test for determining the adaptability of a new onion to any given region is stressed.

The pungency of onion bulb as influenced by the stage of development of the plant, H. Platenius and J. E. Knott (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 481–483, figs. 2*).—Observations by the Cornell University on the amount of volatile sulfur in Italian Red, Valencia, and Long Keeping Yellow Globe onions harvested at different stages of maturity showed an increase in volatile sulfur as maturity increased. Varieties differed in their volatile sulfur content in accordance with their known pungency. A second trial in which Ebenezer, Italian Red, and Valencia onions were sampled at 2- to 3-week intervals beginning July 8 showed the same general trend. The peak in volatile sulfur was reached just before the tops began to fall. Since this stage was reached at different times in the three varieties, it was evident that growth stage and not environment was the causal fastor. Since onions undergo fairly rapid changes in pungency in storage, the authors stressed the need of prompt determinations of volatible sulfur after sampling.

Bolting habit in the onion, H. A. Jones, C. F. Poole, and S. L. Emsweller (*Amer. Soc. Hort. Sci. Proc., 32 (1935), p. 490*).—Certain onion varieties such as Italian Red, California Early Red, and Stockton Yellow Globe sown in central California in late August and transplanted to the field in late November and December showed a marked tendency to seed prematurely in seasons characterized by warm autumns and cool springs. When the autumn was cool and the spring warm, bolting was very slight. Progress was made by the California Experiment Station at Davis in the development of lines with much less tendency to bolt even under conditions favoring this phenomenon.

Morphology of the flower, fruit, and seed of Raphanus sativus Linnaeus, M. E. Roseil (*Philippine Agr., 25 (1936), No. 6, pp. 521–540, figs. 37*).—A description is presented of the development of the flower, gametophytes, fruit, and seed of the radish.

Correct handling of tomato plants pays, W. T. Tapley (*Farm Res. [New York State Sta.], 3 (1937), No. 3, pp. 12, 13*).—General information is presented on the growing of tomato plants, setting in the field, and subsequent care. The author suggests that if the grower has the right facilities and follows the correct procedure, it is likely he can grow better plants than he can secure elsewhere.

New uses for fruits and vegetables, D. K. Tressler (*Farm Res. [New York State Sta.], 3 (1937), No. 3, pp. 14, 16*).—Special reference is made to the new quick-freezing and dehydrating processes and to the fruit and vegetable juice industry as a means of disposing of unusually large crops. The use of frozen fruits and vegetables and the future of the industry are considered.

[Pomological investigations by the Iowa Station] (*Iowa Sta. Rpt. 1936, pt. 1, pp. 158–168, figs. 3*).—Included are reports on studies on the development of uniform and desirable apple stocks, by T. J. Maney and B. S. Pickett; correlation of bound water in apple wood with hardiness, by Maney; behavior of apple varieties in different storage temperatures, by H. H. Plagge; systems of soil management for apple orchards, by Pickett and Maney; breeding of apples, by H. L. Lantz, Pickett, and Maney; pear breeding, by Pickett and Lantz; plum breeding, by Pickett, Lantz, and Maney; breeding hardier varieties of peaches, by Maney, Lantz, and Pickett; apple varieties, by Lantz, Pickett, and

Maney; breeding of black raspberries immune to anthracnose, by Maney; crushed firebrick as a rooting medium for greenhouse and nursery plants, by Pickett and V. T. Stoutemyer; respiration in stored Jonathan apples as related to soggy breakdown and other troubles, by Plagge; adaptation and culture of strawberry varieties in southeastern Iowa, by Maney and Pickett; influence of stock on the yielding capacity of apples, by Maney; and propagation of apple as associated with juvenile forms and adventitious buds, by Pickett, Stoutemyer, and A. F. Dodge.

Farm orchard investigations, O. R. Mathews and V. I. Clark (*U. S. Dept. Agr. Circ. 421 (1937), pp. 43–45*).—Among subjects discussed are the spacing of fruit trees, protection of trees from rabbits, testing of apple and plum varieties, and general suggestions for the establishment and maintenance of fruit plantations.

Hardy fruits, with special reference to their culture in western Canada, C. F. Patterson (*Saskatoon, Sask.: Author, 1936, pp. XVI+321, figs. 62*).—This is a general discussion of varieties, culture, propagation, pruning, spraying, etc.

Pollination and fruit setting, A. E. Murneek (*Missouri Sta. Bul. 379 (1937), pp. 28, figs. 18*).—Among subjects discussed in this bulletin, designed primarily for the fruit grower, are the process of pollination and fertilization, fruitfulness and sterility, interfruitfulness among apple varieties, effective pollinizers, the blooming periods of different varieties, suggestions for interplanting to secure favorable pollination, the role of bees in orchard pollination, effects of weather and tree vigor on fruit setting, apple drops, overbearing as related to biennial fruiting, and the pollination of various fruits such as pear, peach, cherry, plum, grape, and cane fruits.

The results of 50 years of breeding apples, G. H. Howe (*Farm Res. [New York State Sta.], 3 (1937), No. 3, pp. 3, 8*).—This, the second in a series (E. S. R., 76, p. 795), describes further promising apples originated by or tested by the station. Of the many varieties utilized as parents, McIntosh and Delicious are said to have yielded the greatest number of meritorious seedlings. Red sports from different sources are given special consideration in the discussion.

Root growth in young apple trees made shortly before and after defoliation, A. J. Heinicke (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 164, 165, fig. 1*).—A comparison at Cornell University of the root development of young McIntosh apple trees defoliated on September 15 with that of comparable nondefoliated trees showed that root activity was greatly retarded by leaf removal. The author points out that if there is any advantage in having a considerable root growth in late autumn, conditions should be made favorable for leaf retention. In the control trees relatively little new root development took place after the leaves had fallen.

The relationship between the internal structure and photosynthetic behavior of apple leaves, W. F. Pickett (*Kansas Sta. Tech. Bul. 42 (1937), pp. 58, figs. 7*).—In this summation of a comprehensive study, a preliminary report upon which has been noted (E. S. R., 74, p. 202), the author points out that under similar environments the leaves of different apple varieties vary in their rate of photosynthetic activity and that this different capacity is correlated with the extent of the intercellular space. There were, however, other factors influencing photosynthesis, including chlorophyll content, nitrate and moisture supply, temperature, and carbon dioxide content of the atmosphere. Among varieties, the Livland ranked high in rate of photosynthetic activity per unit area of leaf. York Imperial, under comparable conditions, rated consistently lower and had at the same time a much lesser extent of intercellular

space. The author suggests that the low activity of York leaves may be one of the factors underlying the well-known biennial fruiting habit of this variety.

Studies of stomata showed the Livland leaves to have the smallest number per unit of area of any of the varieties studied. The Livland stomata were, however, longer than those of any other variety. Fewer stomata were open in the morning in the Livland and Wealthy than in the other varieties.

Determinations of gain in dry weight of unit area taken from leaves of different varieties showed that the daily maximum temperature exerts a pronounced influence on the dry matter gain. In general, the higher the temperature the lower the gain. During three consecutive seasons, York Imperial made lower daily gains in total dry matter and lower gains in total hydrolyzable carbohydrates estimated as glucose than did any of the other varieties under study.

The photosynthesis, transpiration, and stomata of apple leaves as affected by certain nutrient deficiencies, N. F. CHILDERS and F. F. COWART (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 160–163*).—At Cornell University young McIntosh apple trees growing in the greenhouse in containers of sand and supplied with nutrient solutions lacking in one or more of the major plant food elements were examined with respect to transpiration, photosynthetic activity, and stomatal movement. The absence of nitrogen from the nutrient solution caused by far the greatest reduction in carbon dioxide assimilation and in transpiration per unit of leaf area. The maximum assimilation of carbon dioxide occurred in the full nutrient plants, with the minus P plants approximately equal. The absence of P or K, or both, had little effect on transpiration. The number of stomata per given area was greater in leaves of plants deficient in certain elements, particularly N, but the stomatal movement of plants deficient in N was distinctly sluggish.

The effect of some summer oil sprays upon the carbon dioxide absorption of apple leaves, R. A. SCHROEDER (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 170–172*).—Applying sprays with a hand atomizer to the leaves of potted Delicious apple trees and using a modified Heinicke and Hoffman apparatus for measuring CO_2 assimilation, the author found at the University of Missouri that with both increased viscosity and increased percentage of oil in the spray there is an increase in the amount of reduction of carbon dioxide absorption. There was no great difference between oils of 80 and 110 viscosity. A further reduction in carbon dioxide assimilation was noted following the application of a second spray. The recovery of leaves was less with vegetable than with mineral oils.

Blossom performance of Newtown terminal growth in relation to alternate bearing, pruning, and thinning of fruit, G. G. BROWN (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 693–699*).—Yield data taken in 1934–35 by the Oregon Experiment Station on Newtown apple trees which prior to the removal of alternate trees in the spring of 1933 had lapsed into pronounced biennial bearing showed definite indications of a return to annual fruiting. An application of 6 lb. of nitrate of soda per tree per year was involved in the favorable response. Comparatively severe pruning of some of the trees in 1933 had no material effect on yields in 1934, but thinning of the fruit in 1934 did influence 1935 production. In all cases where the fruit was thinned from 10 to 12 in. in 1934, yields in 1935 were decidedly larger than on trees the fruit of which was thinned to 6 in. The grand average of all buds, terminal and axillary, on 1933 terminals which differentiated bloom during the first year of growth and on extensions thereon during 1934, was 14.1 percent for the 6 in. thinned plats and 27.84 percent for the 10 to 12 in. plats.

Studies to determine the effect of "Freon" in the atmosphere upon apples in cold storage, C. E. BAKER (*Amer. Soc. Hort. Sci. Proc., 32 (1935), p. 214*).—"Freon", a proprietary refrigerant of practically no odor and when used as a compressible gas of much lower temperature-pressure relationship than ammonia, was studied by Purdue University as to its effect in various concentrations and at various temperatures on Delicious, Golden Delicious, and Winesap apples. Under the prevailing conditions, there was noted no injury to the fruit that could be attributed to the gas except when the air was almost completely replaced. When the concentration simulated that involving refrigerant leaks of considerable extent and duration, no injury was observed. Considerable quantities of the gas were inhaled by the author without apparent harm.

Wrapping Golden Delicious apples in moisture-proof cellulose sheets to prevent shriveling in cold storage, C. E. BAKER (*Amer. Soc. Hort. Sci. Proc., 32 (1935), p. 213*).—Experiments conducted by the Purdue University over a period of 3 yr. indicate that wrapping in a moisture-proof grade of transparent cellulose prevents wilting to a high degree and over a long period. Under the same conditions, unwrapped apples in tub baskets with paper liners and pads were unsalable by early winter. Golden Delicious apples appeared to withstand tight wrappers much better than did Grimes Golden and some other varieties.

Decreasing the germination delay in stone fruits [trans. title], F. HILKENBÄUMER (*Landw. Jahrb., 82 (1936), No. 6, pp. 883–924, figs. 4*).—Working with plum, sweet cherry, sour cherry, and peach seeds, the author found that the seeds of different mother trees within a species exhibit material variation in their germination. When seeds were not removed immediately from the flesh at harvest, or the fruits were fermented even for a short time, germination was delayed and reduced. Of four media, peat, sand, sand and peat, and peat and soil, peat was most effective in hastening germination. Germination was increased by peat only in the case of the mahaleb cherry and the peach. Low and varying temperatures in damp storage reduced germination except in the peach. Storage and seedbed temperatures over 12° C. hindered germination. Temperatures from −10° to −65° had no beneficial or harmful effects on air-dried seed. The several species had different optimum germination temperatures. Immersion in water at 12° had no effect on germination, except in the case of the mahaleb cherry. At 24° germination was decreased and delayed. Various chemical agents, such as sulfuric acid and chloride of lime, were tested and for the most part were accelerating to germination. The bony seed shell delayed germination only to a certain degree. The causes of delayed germination are said to rest in the specific nature of the seed and not in external factors such a seed shell.

Why is one half of a peach larger than the other? H. B. TUKEY (*Farm Res. [New York State Sta.], 3 (1937), No. 3, p. 11, fig. 1*).—This is a popular discussion of the investigations previously noted (E. S. R., 77, p. 48).

Missouri peach culture, T. J. TALBERT (*Missouri Sta. Bul. 380 (1937), pp. 30, figs. 12*).—General information is presented on locating orchard sites, selection of varieties, methods of planting, general culture, pruning, fruit thinning, control of pests, and harvesting and marketing practices.

Studies on the effect of humidity in the cold storage of fruits, F. W. ALLEN and W. T. PENTZER (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 215–223, figs. 4*).—In studies conducted jointly by the University of California and the U. S. Department of Agriculture, it was observed that in the case of Emperor grapes saturated atmospheres were needed to approach suspension of moisture loss

and that transpiration increased with each decrease in relative humidity down to 40 percent. Weight loss of 1.2 percent did not cause shriveling. A relative humidity of 85 percent proved most satisfactory for Emperor grapes. Likewise with apricots, plums, peaches, and apples, a saturated atmosphere was required to prevent moisture loss. High relative humidity had no apparent detrimental effect on pears or apples and little upon sound plums held at 32° F., although some mold appeared on the exterior of the packages after 4 to 8 weeks. Apricots held for 10 days at a relative humidity of 95 to 100 percent and at 50° tended to take on a watery appearance before becoming fully ripe. In general, deciduous fruits held at about 32° were most attractive in appearance and texture when the humidity was maintained at 90 percent or above.

Red Lake, a promising new currant (*Farm Res.* [*New York State Sta.*], *3* (*1937*), *No. 3, p. 2*).—A brief description is presented of a new variety originated by the Minnesota Experiment Station.

Grape pruning in Illinois, V. W. KELLEY (*Illinois Sta. Circ. 468* (*1937*), *pp. 16, figs. 11*).—Among material covered in this circular of general information is the need of pruning, methods of training, construction of trellises, relation of number of buds to production, renewal of neglected vines, and the interrelationship between pruning and training and other factors in the management of vineyards.

A manurial experiment on bananas, R. C. WOOD (*Empire Jour. Expt. Agr.*, *4* (*1936*), *No. 16, pp. 365–367, fig. 1*).—In studies at the Imperial College of Tropical Agriculture, Trinidad, the addition of potash to manures supplying nitrogen gave profitable increases in the yield of Dwarf Cavendish bananas. On the addition of phosphorus to the nitrogen and potash materials, however, the yields were less than with these materials alone.

Rootstock and scion influence in citrus, R. W. HODGSON, S. H. CAMERON, and E. R. EGGERS (*Calif. Citrogr.*, *22* (*1937*), *No. 3, p. 110, figs. 2*).—At the end of their seventh growing season, trees of trifoliate orange budded on trifoliate and rough lemon stocks and of rough lemon budded on rough lemon and trifoliate orange were carefully dug and records taken of top and root growth. Using as standards for comparison the trees budded on themselves, it was found that the rough lemon scion had greatly stimulated trifoliate rootstock and reciprocally the trifoliate scion had markedly reduced the growth of the rough lemon rootstock. By far the largest tree of all was the rough lemon budded on itself and the smallest tree was the trifoliate orange budded on itself. Rootstock and scion influences appeared to be reciprocal in nature.

Effect of humidity on transpiration of rooted lemon cuttings under controlled conditions, J. BIALOGLOWSKI (*Amer. Soc. Hort. Sci. Proc.*, *32* (*1935*), *pp. 166–169, figs. 2*).—Using rooted Eureka lemon cuttings possessing three or four mature leaves or rooted single leaves growing in an artificially controlled environment, the author found, in studies conducted by the University of California, that the loss of water from rooted lemon cuttings was not directly related to the saturation vapor pressure deficit. At 30° C., the rate of transpiration is a function of humidity in the range of 95 to 60 percent humidity. A very pronounced retardation was recorded below 60 percent. At 25° and 20° the effect of external factors is most accentuated in a straight line relationship between transpiration and relative humidity.

Cold storage studies of Florida citrus fruits, I, II, (*Florida Sta. Buls. 303* (*1936*), *pp. 67, figs. 13; 304* (*1936*), *pp. 78, figs. 23*).—Two bulletins are presented.

I. *Effect of temperature and maturity on the changes in composition and keeping quality of oranges and grapefruit in cold storage,* A. L. Stahl and A. F.

Camp.—Studies of the effect of temperature and maturity on the keeping quality and changes in composition of freshly harvested, untreated, and unwrapped oranges and grapefruits held at 32°, 37.5°, 42°, 48°, 54°, and 58° F., with relative humidity approximating 85 to 90 percent where possible, showed a direct relationship between the rate of change in composition and the storage temperature.

In the Pineapple orange there was noted a decrease in total weight, volume, and percentage of juice, with very slight changes in percentage of sugars, pH, and percentage of citric acid. In the Valencia there was a decrease in total weight, specific gravity, percentage of juice, and percentage of acid and an increase in total sugars with the length of storage. The pH values also increased, suggesting a decrease in effective acidity. Weight losses were less in all varieties at the lower temperatures and increased with greater maturity at the time of harvest. The amount of decay increased with storage temperatures, but 37.5° was better than 32° because fruit kept marketable for a longer time after removal from storage.

In the case of grapefruit, total weight decreased with length of storage. The percentage of free-reducing, hydrolyzable, and total sugars increased, but there was very slight change in acidity. As with the orange, the lower the temperature the less rapid the changes in composition. Considering all factors—weight loss, decay, etc.—37.5° was found the best of the several temperatures for storing grapefruit.

II. *Effect of various wrappers and temperatures on the preservation of citrus fruits in storage*, A. L. Stahl and W. M. Fifield.—In this second paper there are discussed the results of trials of 22 different wrappers for oranges and grapefruit.

The moistureproof wrappers, aluminum foil, cellophane, etc., were found superior in reducing losses in weight and preserving the general appearance of both oranges and grapefruit. In moistureproof wrappers, Pineapple oranges and grapefruit kept 3–4 mo. in good condition, and Valencia oranges for 5 mo., much longer than when unwrapped or when wrapped in ordinary tissue. In the case of the orange, a box liner of moistureproof material was as effective as individual wrappers. In the grapefruit, a combination of moistureproof lining and individual tissue wraps proved very satisfactory and saved material. With both fruits a temperature of 37.5 was again found more desirable than higher or lower temperatures.

Breeding for earliness and hardiness in chrysanthemums, F. L. Mulford (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 690–692*).—Stating that in the Northern States there are very few varieties of hardy chrysanthemums that bloom before heavy frost, the author discusses the work of the U. S. Department of Agriculture in the development of early flowering varieties. Of a total of 101 promising seedlings, 34 were early, 31 midseason, and 36 late. There was no apparent correlation between flower type and season of bloom, but there was a slight indication that certain colors, namely, red, blush, and lemon, may possibly be associated with late blooming.

Storage of French marigolds, M. S. Neff and W. E. Loomis (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 683–685*).—In experiments at the Iowa State College, French marigolds were found to store better at 40° than at 33° F. Wrapping the flowers in waxed paper reduced turgidity of the blooms and prolonged their life as compared with comparable flowers standing in water. Flowers wrapped in moist moss and waxed paper did not keep satisfactorily because of early maturity and the development of foliage diseases.

The effect of fertilizers on the yield of narcissus bulbs, M. M. Parker (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 678–682*).—At the Virginia Truck Experiment Station large-sized King Alfred bulbs, fertilized at the time of planting with a 2–10–5 mixture applied at the rate of 1,000 lb. per acre, yielded more and heavier bulbs than the nonfertilized plats, but the differences were not significant unless a top dressing of a 9–8–3 material was added the following spring. The effects of fertilizer treatments were more pronounced on smaller bulbs. Fertilization resulted in a decrease in round bulbs and cannot be recommended when the objective is round bulbs for forcing. It is pointed out that the number of flowering stalks the next spring after planting might be decreased by fertilization.

Further experiments with high test pyrethrum strains, B. D. Drain, C. B. Gnadinger, C. S. Corl, and G. A. Shuey (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 201–204*).—The results are presented of the analyses for pyrethrin in various vegetative strains of pyrethrum, in individual plants of single strains, and in a new group of selections from seedlings of Swiss origin. In general it was shown that the pyrethrin content is fairly uniform in plants of a single strain, with differences for the most part only slightly greater than would be expected between duplex determinations on a single sample. The evidence supported earlier conclusions (E. S. R., 73, p. 618) that there exist high pyrethrin-producing strains of pyrethrum.

Hardiness tests of some perennial Sedums, E. D. Hansing, L. E. Longley, L. Sando, and R. B. Harvey (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 686–689*).—A total of 16 species of *Sedum* were tested by the University of Minnesota in freezing chambers as to their resistance to low temperatures. At near-killing temperature, the roots and stems were injured first with the stem tips and leaves retaining the capacity to send forth roots. Species native to central and northern Europe, northern Asia, and northeastern United States proved to be hardy.

A method for determining the nutrient needs of shade trees with special reference to phosphorus, H. L. Mitchell (*Black Rock Forest Papers, 1 (1935), No. 1, pp. 4, fig. 1*).—Analyses of leaves collected from sample plats established in a mixed hardwood stand, composed mainly of red and chestnut oaks and red maple and fertilized with different amounts of finely ground rock phosphate, showed a close association between soil phosphorus supply and the quantity of this element in the red oak leaves. The phosphorus contents of red maple and chestnut oak leaves were also proportional to the phosphorus supply.

FORESTRY

[Forestry studies by the Iowa Station] (*Iowa Sta. Rpt. 1936, pt. 1, pp. 142, 144, 145, fig. 1*).—Among projects the progress of which is discussed are the establishment and maintenance of nurseries for producing trees and shrubs, and volume, growth, and yield studies with Iowa trees, both by G. B. MacDonald; and the direct seeding of woody plants in erosion control, by A. F. Dodge.

Oregon's forest problems (*Portland: Oreg. State Planning Bd., 1936, pp. [7]+19, [pls. 6]*).—This report to the Governor and Legislative Assembly of Oregon discusses the importance of the forest resources and the major forest problems of the State, and makes recommendations for policies and legislation.

Shelterbelt investigations, O. R. Mathews and V. I. Clark (*U. S. Dept. Agr. Circ. 421 (1937), pp. 38–43*).—Results are presented on trials of species, spacing distances, pruning, comparisons of cultivation, mulching, and no cultivation, and methods of arrangement.

Effect of stand density on mortality and growth of loblolly pine, E. M. SIMMONS and G. L. SCHNUR (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 1, pp. 47–58*).—Continuing studies (E. S. R., 72, p. 629), the authors report that analysis of 25-yr. records of 44 sample plats in old-field stands of loblolly pine (*Pinus taeda* L.) on the Eastern Shore of Maryland show that mortality and growth are both significantly correlated with stand density and basal area. Growth rate increases as density and basal area decrease, but the opposite is true of mortality. Stand density is rigidly determined from the average regression: log number of trees per acre=4.075−1.603 log average diameter breast high. Basal area is significantly correlated with age and site index, but density is not. Growth and mortality may be estimated from tables presented for 5-, 10-, and 15-yr. periods if present density and basal area are known. The errors of estimate are high, but the trends are significant. Estimates of future mortality indicate the minimum amounts that should be removed in thinnings. Growth correlations indicate 15 yr. as the maximum interval between thinnings, and that the shorter the interval the better the results.

Elements of forest mensuration, H. H. CHAPMAN and D. B. DEMERITT (*Albany, N. Y.: J. B. Lyon Co., 1936, 2. ed., rev., pp. 451, figs. 89*).—This is a revised edition of this book (E. S. R., 67, p. 688).

Fire Control Notes (*U. S. Dept. Agr., Forest Serv., Fire Control Notes, 1936, No. 1, pp. 52, figs. 7; 1937, Nos. 2, pp. 53–109, figs. 5; 3, pp. 110–167*).—These, the first three in a new series of publications devoted to the technic of fire control, contain general information on fire prevention and suppression, with brief articles by various workers throughout the Nation on features such as equipment, methods, and experiences.

DISEASES OF PLANTS

Abstracts of papers accepted for presentation at the twenty-eighth annual meeting of The American Phytopathological Society, Atlantic City, New Jersey, December 28–31, 1936 (*Phytopathology, 27* (*1937*), *No. 2, pp. 119–144*).—Abstracts of the following papers are included: Development and Experiences in the Use of Apparatus for Pouring and Washing Agar Plates, by W. E. Ahrens (p. 121); Distribution of Spores of Wilt-Inducing Fungi Throughout the Vascular System of the Elm by the Sap Stream, by W. M. Banfield (pp. 121, 122); Possible Relationship of Stanley's Crystalline Tobacco-Mosaic-Virus Material to Intracellular Inclusions Present in Virus-Infected Cells, by H. P. Beale (p. 122); The Dutch Elm Disease in Europe, by R. K. Beattie (p. 122); A Comparison of Linted and Acid-Delinted Cotton Seed, by J. G. Brown (pp. 122, 123); Symptoms and Terminology in Some Physiogenic Apple Diseases, by A. B. Burrell (p. 123); Boric Acid Treatment of a Physiogenic Apple Disease [Drought Spot, Cork, Rosette, and Dieback], by A. B. Burrell and H. J. Miller (p. 123); Cultural Characters of *Thyrostroma compactum*, From Chinese Elm, by J. C. Carter (pp. 123, 124); The Limitations of Plant Virus Serology, by K. S. Chester (p. 124); Spraying as a Method of Control for Mildew (*Peronospora tabacina*) and Wildfire (*Bacterium tabacum*) in Tobacco Plant Beds, by E. E. Clayton (p. 124); Germination of Conidia of *Peronospora effusa* From Spinach (p. 124) and *Sclerotinia sclerotiorum* on Pyrethrum (pp. 124, 125), both by H. T. Cook; Cucumber Mosaic in Puerto Rico (p. 125) and The Witches'-Broom of *Tabebuia pallida* Caused by a Virus (p. 125), both by M. T. Cook; Savoy, a Virus Disease of Beet Transmitted by *Piesma cinerea*, by G. H. Coons, J. E. Kotila, and D. Stewart (p. 125); Bunch Disease of Pecans [Successfully Transmitted by Grafting], by J. R. Cole (p. 125); Wetwood [a Bacterial Vascular Disease in the Sali-

aceae], by B. S. Crandall, C. Hartley, and R. W. Davidson (p. 126); The nteraction of Two Apple-Rotting Fungi [*Sclerotinia fructigena* and *Penicillium expansum*], by H. R. X. D'Aeth (p. 126); Reduction of Bordeaux Mixure Injury by the Use of Amendments, by R. H. Daines and W. H. Martin (p. 126); Nitrogen Supply of Sugar Beets in Sand Cultures in Relation to Extent of Injury by Southern *Sclerotium* Rot, by A. E. Davey (pp. 126, 127); Cultural Identification as a Necessary Supplement to Tree Decay Studies, by R. W. Davidson, W. A. Campbell, and D. J. Blaisdell (p. 127); The *Cercospora* Leaf Spot of Rose Caused by *Mycosphaerella rosicola* [n. sp.], by B. H. Davis (p. 127); Some Disease Developments in Forest Nurseries, by W. C. Davis, D. H. Latham, and G. Y. Young (pp. 127, 128); Seed Treatment in Relation to Sand Culture of Seedlings, by A. A. Dunlap (p. 128); *Corticium* Disease of Turf, by L. E. Erwin (p. 128); Environmental Conditions Influencing the Development of Tomato Pockets or Puffs (p. 128) and Environmental Factors Influencing the Development of Blossom-End Rot of Tomatoes (pp. 128, 129), both by A. C. Foster; Factors Affecting the Prevalence of the Spotted Wilt Virus, by M. W. Gardner, C. M. Tompkins, and H. R. Thomas (p. 129); Evaluation of the Geneva Experiment on [Apple] Scab Control, by W. O. Glover (p. 129); Breeding Disease-Resistant Chestnut Trees, by A. H. Graves (pp. 129, 130); Control of Club Root of Crucifers, by C. M. Haenseler (p. 130); *Cercospora* Leaf Spot of *Calendula*, by J. G. Harrar (p. 130); Movement of Intracellular Bodies Associated With Peach Yellows, by A. Hartzell (pp. 130, 131); Histological Studies of Infection and Sporulation of *Peronospora tabacina* in Tobacco Seedlings, by R. G. Henderson (p. 131); Inheritance of Plant Characters and Resistance to Fire Blight in Pear, by E. M. Hildebrand and S. L. Hsiong (p. 131); Hereditary Factors Affecting Tobacco-Mosaic Disease in Solanaceous Plants, by F. O. Holmes (pp. 131, 132); Effect of Copper Sprays on Ripening of Tomatoes [New York], by J. G. Horsfall, R. O. Magie, and C. H. Cunningham (p. 132); Studies on a Ring-Spot Type of Virus of Tomato, by E. P. Imle and R. W. Samson (p. 132); Aerial Bacterial Strands in Fire Blight, by S. S. Ivanoff and G. W. Keitt (p. 132); Experimental Spraying for Combined Control of Apple Scab and Fire Blight, by G. W. Keitt and J. B. Carpenter (p. 133); Eradicant Fungicides in Relation to Apple-Scab Control, by G. W. Keitt and D. H. Palmiter (p. 133); Contaminated Soil in Relation to the Epiphytology of Tobacco Mosaic, by S. G. Lehman (p. 133); Crown Gall on *Nicotiana glauca* and *Nicotiana langsdorffii* and the Spontaneous "Tumors" of Their Hybrid, by M. Levine (p. 134); A Growth Hormone in the Development of Crown Gall, by S. B. Locke, A. J. Riker, and B. M. Duggar (p. 134); Inactivation of Tobacco-Mosaic Virus by Ascorbic Acid, by M. Lojkin (p. 134); Comparative Properties of Virus Proteins From a Single-Lesion Strain and From Ordinary Tobacco-Mosaic Virus, by H. S. Loring and W. M. Stanley (pp. 134, 135); An Iris Leaf Disease Caused by *Bacterium tardicrescens* n. sp., by L. McCulloch (p. 135); Isolation of Pathogenic Variants From Pure Cultures of *Bacterium stewarti*, by G. L. McNew (p. 135); *Didymellina poecilospora*, n. sp., a Semiparasitic *Heterosporium* on Bulbous Iris, by F. P. McWhorter (pp. 135, 136); Control of *Rhizoctonia* With Aniline Dyes, by J. Monteith, Jr. (p. 136); Comparison of Enzymes in Crown-Gall and Noninoculated Plant Tissue, by R. Nagy, W. H. Peterson, and A. J. Riker (p. 136); A Disorder of Cotton Plants [Resembling in Certain Respects the Symptoms Caused by Some of the Mosaic Diseases] Recently Observed in Louisiana, by D. C. Neal (p. 136); *Verticillium* Wilt of Peppermint (p. 137) and Basal Dry Rot of Gladiolus Corms (p. 137), both by R. Nelson; Blue Stain of Cotton Is Due to a Fungus, by O. P. Owens (p. 137); An Unde-

scribed Potato Disease [Cause Unknown], in West Virginia, by C. R. Orton and L. M. Hill (pp. 137, 138); Studies of Copper-Lime-Arsenite Dusts for Control of Wheat Bunt, by D. H. Palmiter and G. W. Keitt (p. 138); Marigold Wilt [Caused by *Phytophthora* sp.], by P. P. Pirone (p. 138); Classification of Lily-Mosaic Virus, by W. C. Price (pp. 138, 139); Root Rot of Rice [Associated With *Pythium* sp.], by T. C. Ryker (p. 139); Methods and Results of Studying Some of the Factors Involved in Spray Injury of the Apple, by F. J. Schneiderhan (p. 139); Basal Decay in Oak Stands of Sprout Origin, by B. Sleeth and E. R. Roth (pp. 139, 140); Studies on the Host Range of *Bacterium solanacearum*, by T. E. Smith (p. 140); Relation of Injuries to Infection of American Elm by *Ceratostomella ulmi*, by S. J. Smucker (p. 140); Influence of Nutrition on Systemic Development of a Yellow Strain of Tobacco Mosaic, by E. L. Spencer (p. 140); Seasonal Cycle of *Ustilago hordei*, by V. F. Tapke (p. 141); Laboratory Studies on the Fungicidal Properties of Sulphur, by J. J. Taubenhaus (p. 141); Separation of *Actinomyces* Isolates Obtained From Scabbed Potatoes and From Soil, by C. F. Taylor (p. 141); Inheritance of Resistance of Barley to an Undescribed Physiologic Form of *Erysiphe graminis hordei* (pp. 141, 142) and Reaction of Barley to Two Undescribed Physiologic Races of Barley Mildew, *Erysiphe graminis hordei* (p. 142), both by J. S. Tidd; The Fungicidal Value of Mustard Oils, by J. C. Walker (p. 142); Increasing Importance of Cabbage Mosaic, by J. C. Walker and R. H. Larson (p. 142); Pathogenicity of a Brown Cultural Variant of *Ceratostomella ulmi*, by J. M. Walter and C. May (pp. 142, 143); Penetration and Invasion of *Phymatotrichum omnivorum* in Cotton Roots Grown Under Pure-Culture Conditions, by G. M. Watkins (p. 143); Antiseptic and Disinfectant Treatments of Flowering Bulbs, by F. Weiss (p. 143); Noninfectious Chlorosis of Perennial Phlox and Its Relation to Phlox Blight, by F. Weiss and T. B. Post (pp. 143, 144); Control of Damping Off of Conifers, by G. Y. Young, W. C. Davis, and D. H. Latham (p. 144); and Pea Streak and Its Relationship to Strains of Alfalfa Mosaic, by W. J. Zaumeyer (p. 144).

Diseases of plants in the United States in 1935, compiled by H. A. Edson and J. I. Wood (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1936, Sup. 96, pp. 115–289, figs. 20*).—The diseases reported are listed under those of cereal, forage and cover, fruit, nut, vegetable, special, and sugar crops, and under trees and ornamental and miscellaneous plants. Under each of these sections the hosts are given alphabetically by scientific names (with cross references from the common names), and under the hosts the diseases are also listed alphabetically in the following order: Fungus, bacterial, nematode, virus, and nonparasitic. Except for the arrangement, the subject matter is presented in essentially the same way as in other recent summaries. The collaborators are listed by States.

Index of organisms and non-parasitic diesases in The Plant Disease Reporter Supplements 91–96, 1936, N. W. Nance (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1936, Sup. 97, pp. 291–319*)

The Plant Disease Reporter, March 15 and April 1, 1937 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 21 (1937), Nos. 5, pp. 85–99, figs. 2; 6, pp. 101–109, figs. 2*).—Notes on the following subjects are included:

No. 5.—A striking example of varietal resistance of roses to crown gall, by F. L. Howard; infectious hairy root (*Phytomonas rhizogenes*) on rose, by I M. Hildebrand; a serious blight of the Philippine lily (*Lilium formosanum* cause by *Botrytis elliptica*, by F. L. Howard; *Fusarium poae* on spring oa in Oregon, by R. Sprague; early development of the apple scab fungus ...chusetts, by O. C. Boyd; fruit diseases in Idaho, 1936 (including fungi

bacterial, virus, and nonparasitic diseases, and those of undetermined cause), by E. C. Blodgett; and bean rust (*Uromyces phaseoli typica*) in southern Florida, by G. R. Townsend.

No. 6.—Third experimental forecast of the incidence of bacterial wilt of corn, by N. E. Stevens; and tobacco downy mildew developments to date (mid-March 1937) for Georgia, North Carolina, and South Carolina, by E. E. Clayton.

A contribution to the physiology of diseased plants, V. F. Kuprevich (W. Th. Kuprewicz) (*Trudy Bot. Inst. Akad. Nauk SSSR, Eksper. Bot.* (*Acta Inst. Bot. Acad. Sci. URSS, Bot. Expt.*), *4. ser., No. 2 (1936), pp. 283–345, figs. 11; Eng. abs., pp. 335–339*).—This is a comparative study of the physiological processes in healthy plants v. those infected by various fungus and virus diseases. The material used consisted of *Cirsium arvense* infected by *Puccinia suaveolens*, Victoria field peas infected by *Mycosphaerella pinodes*, *Trifolium hybridum* infected by *Erysiphe communis*, and potatoes infected by mosaic, leaf roll, and aucuba mosaic. A bibliography of 157 titles is included.

Analysis of typical plant diseases from the quarantine standpoint, W. A. McCubbin (*Phytopathology, 26 (1936), No. 10, pp. 991–1006*).—An analysis of 200 typical plant diseases from the quarantine standpoint indicates the type of action (embargo, detention, disinfection, inspection, and unrestricted entry) which would be necessary for seeds, propagating materials other than seeds, and commercial products of the chief host, if exclusion of these diseases were aimed at. Summarized results indicate that in these examples embargo is scarcely needed for seeds and would have a minor use for other propagating materials, but would be necessary on a large scale for commercial products. Comparatively few seeds would require detention, but for other propagating materials detention should be freely used. Disinfection, the important procedure for seeds, is only moderately useful for other propagating materials and for commercial products. Inspection of itself has in all three categories a very low rank for exclusion purposes. Many seeds, but very little other propagating material and a rather limited number of commercial products, are held safe for unrestricted entry. Effective quarantine protection is practically attainable for propagating materials, but the need for excessive embargo in the case of commercial products tends to restrict such action to a compromise system far short of perfection.

[Plant disease work by the Delaware Station] (*Delaware Sta. Bul. 205 (1936), pp. 37, 38, 39–45*).—Reports of progress are given on studies relating to the dissemination of peach yellows and little peach by *Macropsis trimaculata* and the masking of peach yellows and little peach in plums and other *Prunus* species, both by T. F. Manns and F. R. Davies; chemical treatments of sweetpotato sprouts and slips for control of wilt and improvement of the set, by Manns and J. W. Heuberger; tomato foot rot (*Macrosporium solani*) control, by Manns; and diseases of cucurbits, bacterial spot *B*[*acterium*] *pruni* [= *Phytomonas pruni*], and diseases of soybean, all by J. F. Adams.

[Phytopathological studies by the Iowa Station] (*Iowa Sta. Rpt. 1936, pts. 1, pp. 97–104, 106–108, 109, 110, 111, 112, 113, 141, 142, figs. 3; 2, pp. 35, 44–49, 49–51, figs. 3*).—Progress reports are included in part 1 on the biology and control of *Colletotrichum lagenarium* on watermelon, by D. V. Layton; breeding and selection of better wilt-resistant strains of watermelons, by J. J. Wilson (E. S. R., 75, p. 364); physiologic specialization and parasitism of crown rust of oats, and making new strains of oats resistant to crown rust by selection and hybridization, both by H. C. Murphy; control of virus diseases of the potato, by C. S. Reddy; host response and control of leaf spot of sugar beets,

by W. J. Henderson and C. M. Nagel; breeding of sugar beet strains resistant to *Cercospora* leaf spot, by S. M. Dietz, Henderson, and Nagel; development and testing of dust fungicides for control of smut of oats, by Reddy; propagation of disease-free sweetpotato seed stock, by Wilson; seedling structure of wilt-resistant watermelons and the inheritance of fruit shape and flesh color, by J. N. Martin; interaction between spacing and environmental factors in sugar beets, by J. M. Aikman; *Phoma terrestris* and *Fusarium zonatum* on onion in Iowa, by I. E. Melhus and Henderson (E. S. R., 74, p. 353); control of gladiolus diseases in Iowa, by Reddy; apple scab and root necrosis, by Melhus; flax diseases in Iowa, by Reddy; plant pathology phases of barley breeding especially for scab resistance, by Reddy and H. D. Hughes; treatment of wheat, flax, and barley for seed-borne plant pathogens, by G. N. Davis and R. H. Porter; influence of pythiaceous damping-off fungi on seedling stands of legumes and other crops and their control, by Melhus and W. F. Buchholtz; plant disease survey of Iowa, by Wilson, Melhus, Reddy, Porter, Davis, and Henderson; the gumming canker of cherry, damping-off of coniferous seedlings, and a necrosis of the foliage in black walnut seedbeds, all by Melhus; and the control of white pine blister rust in Iowa, by G. B. MacDonald, C. J. Drake, Melhus, and D. R. Lubberts.

In part 2, reports of progress are given on the development of laboratory technics for the detection of seed-borne plant pathogens of corn, by Davis and Porter; genetic investigations of bacterial wilt resistance in corn, by E. W. Lindstrom and E. J. Wellhausen; physiological response of the growing plant and the pathogen to chemical treatments of seed corn, by Reddy; the effect of organic mercury dusts on seeds of corn, oats, barley, and flax, by Porter; fermentation products formed by the action of certain fungi on the byproducts of the corn plant, by J. C. Gilman and C. H. Werkman; factors influencing resistance of strains of corn to *Ustilago zeae*, by Melhus and Davis; *Diplodia* dry rot of corn, by Melhus; and the pathogenicity of *Basisporium gallarum* to corn, by Reddy.

[Phytopathological studies by the New Mexico Station] (*New Mexico Sta. Rpt. 1936, pp. 45, 46, 47*).—Reports of progress (E. S. R., 75, p. 56) are given relative to work on apple measles, chlorosis of various plants, and Texas root rot of Chinese elm and other ornamental trees and shrubs.

Organization of the unwalled ascus in two species of Ceratostomella, C. F. ANDRUS and L. L. HARTER (*Jour. Agr. Res. [U. S.], 54 (1937), No. 1, pp. 19–46, figs. 7*).—Stages in the multiplication of unwalled cells previous to ascus formation in *C. moniliformis* and *C. fimbriata* include the crosier type of cell division, as well as several other types of direct and indirect cleavage. The position of the spindles at the time of nuclear division probably provides the most reliable indication as to direct or indirect cell division. Cell divisions are accompanied by significant changes in cell shape. A centrosomelike structure is present as a satellite of nucleoli during the prefusion stage. Nuclear fusion in the ascus is followed by three successive nuclear divisions, all alike except in the size of their structures. The spindle axis is a simple rod without evidence of polar bodies or astral rays. Two and later four chromatin bodies appear on the spindle axis, and two bodies move to each pole. The chromosome number in each species is interpreted to be 2 (diploid), and no reduction occurs in the ascus.

Following nuclear divisions, the spore-producing region of the ascus is differentiated as a single vesicle. The vesiculate condition in *C. moniliformis* is evidenced by a cleavage space surrounding the spore-producing region, while in *C. fimbriata* a definite endogenous wall frequently encloses the vesicle.

The data tended to show that the membrane of the spore-producing vesicle is continuous with or derived from the membrane of the fusion nucleus.

The eight ascospores in *C. moniliformis* originate as protuberances on the surface of the protoplasmic sphere contained in the spore-producing vesicle. Each spore becomes enclosed by a wall of cytoplasm originally composing a part of the external ascus. The process of spore formation in *C. fimbriata* is frequently modified to an extent imposed by the presence of a wall enclosing the spore-producing region of the ascus. In both species immature spores appear attached to a common base which is usually lateral to the longer axis of the ascus.

The mature ascus consists of a compact group of spores to which are attached remnants of inert cytoplasm. Deliquescence involves disorganization of the peripheral cytoplasmic layer but does not appear to involve any wall dissolution in *C. moniliformis* and *C. fimbriata*, since the asci possess no external wall. Mature ascospores possess disk-shaped membranous attachments that apparently originate in a manner similar to spore walls and often hold the spores together in pairs or in groups of four.

Liberation of neutralized virus and antibody from antiserum-virus precipitates, K. S. CHESTER (*Phytopathology, 26 (1936), No. 10, pp. 949–964, figs. 2*).—A technic involving moderate heating followed by selective ammonium sulfate precipitation and dialysis resulted in purification of virus-immune serum by the removal of a large proportion of the serologically inactive serum protein, with little or no loss in antibody content but with retention of only a fraction of the nonspecific inhibitory action of unpurified serum. Neutralized precipitates of tobacco-mosaic virus and specific antibody were prepared by titrating the serum with the virus until the mixtures contained an excess of neither antibody nor virus. When such precipitates were partially digested with pepsin, the antibody was destroyed and a large portion of the virus was recovered, as shown by precipitin and infectivity tests. When similarly neutralized precipitates of potato X-virus and its specific antibody were acidified at pH 4.8 or below, the virus underwent dissolution and large amounts of free antibody were liberated. Titrations of X-virus with its immune serum showed that 1 unit of antibody has the power of combining with and being saturated by any number of units of antigen from 1 to 8. Pepsin digestion of tobacco-mosaic virus antibodies alone failed to result in the recovery of virus, suggesting that antibody is not merely antigen which has been slightly modified by the serum proteins. Inoculation of rabbits with antibody did not result in the production in the animal of counter-antibody with antineutralizing properties.

Effect of certain enzymes and amino-acids on crown gall tissues, P. A. ARK (*Science, 85 (1937), No. 2206, p. 364*).—At the University of California crown galls (*Phytomonas tumefaciens*) of geranium were destroyed in from 4 to 7 days by injection of soft rot bacteria, as were galls of tomato and sunflower. Injection of 0.1 percent water solutions, or placing a few crystals of diastase, papain, pepsin, cysteine hydrochloride, leucine, and isoleucine into crown galls of geranium and sunflower caused them to collapse and dry up within 2 weeks. Tyrosine and tryptophane were ineffective. Pepsin and papain acted most promptly.

Sulphur fungicides, J. F. ADAMS (*Peninsula Hort. Soc. [Del.] Trans., 49 (1935), pp. 48–54*).—This is a general discussion of sulfur fungicides and progress reports of laboratory tests with lime-sulfur and catalytic sulfur in various concentrations and combinations relative to the toxicity for apple scab spores, and of field spray tests with lime-sulfur, alone and combined with catalytic

sulfur, and wet-milled sulfur for control of scab, sooty blotch, flyspeck, and fruit spot, and with respect to russeting of the fruit.

Pathogenic strains in Ustilago nigra, V. F. TAPKE (*Phytopathology, 26 (1936), No. 10, pp. 1033, 1034*).—In a test with the black loose smut of barley (*U. nigra*), 17 host varieties were each inoculated with 10 collections. Two distinguishable pathogenic strains were found and differentiated by their behavior on the varieties Himalaya, Lion, and Nepal.

Varietal testing for the reaction of oats to diseases, especially covered smut, O. S. AAMODT and A. W. PLATT (*Canad. Jour. Res., 14 (1936), No. 12, Sect. C, pp. 425–437*).—By inoculations (with *Ustilago levis*) of 61 varieties of oats in replicated plats over 2 yr. and of 13 varieties over 3 yr., it was indicated that all gradations in reaction from high susceptibility to apparent immunity exist. Dehulling the kernels before inoculation increased the incidence of smut about six times, but susceptible varieties gave relatively greater increases when dehulled than did resistant varieties. There were no significant differences in total smut obtained between any two of the seasons, but the season influenced the relative varietal reaction.

Spontaneous epidemics of halo blight (*Pseudomonas coronafaciens* [=*Phytomonas coronafaciens*]) and blast provided opportunities for obtaining data on the reactions of a large number of varieties. Immunity to neither of these diseases was observed, though marked varietal differences were noted.

The synthetic production of oat varieties resistant to race 6 and certain other physiologic races of oat stem rust, J. N. WELSH (*Canad. Jour Res., 15 (1937), No. 2, Sect. C, pp. 58–69, figs. 5*).—At present, oat varieties classed as resistant to *Puccinia graminis avenae* are resistant to only a certain number of the 10 physiologic races. With the object of combining in a single variety resistance to as many races as possible, a cross was made between the varieties Hajira Strain and Joanette Strain, from which 93 pure lines were obtained. The detailed report of resistance tests with these pure lines forms the bulk of the paper and shows an advance toward the objective noted.

Studies on the control of root-rot diseases of cereals caused by Fusarium culmorum (W. G. SM.) Sacc. and Helminthosporium sativum P., K., and B.—III, Effect of seed treatment on the control of root rot and on the yield of wheat, J. E. MACHACEK and F. J. GREANEY (*Sci. Agr., 15 (1935), No. 9, pp. 607–620; Fr. abs., p. 620*).—Continuing this series (E. S. R., 75, p. 58), the authors report that in greenhouse tests seed treatment with Semesan and Ceresan (liquid and dust forms) and with New Improved Ceresan and Uspulun (liquid form) prevented root rot and wilt (*F. culmorum*) in seedlings of wheat, oats, and barley. Cultural studies indicated copper carbonate to be only slightly toxic to *F. culmorum* and *H. sativum*. Seed treatment with formaldehyde (1934) reduced emergence to such an extent that the yield was significantly lower, while the disease rating was considerably higher.

Field tests (1932–34) gave good control of root rots due to both fungi by the organic mercury fungicides, while copper carbonate failed to control. As far as effectiveness for control was concerned, the dust or liquid methods with any of these compounds were of about equal value.

Studies on the control of root rot diseases of cereals.—IV, Influence of mechanical seed injury on infection by Fusarium culmorum in wheat, J. E. MACHACEK and F. J. GREANEY (*Canad. Jour. Res., 14 (1936), No. 12, Sect. C, pp. 438–444*).—Continuing the series, the authors report that in field experiments (1932–34) successful positive attacks of *Fusarium* root rot were experimentally induced. Reduced emergence, increased root rot, and reduced yield uniformly followed the planting of injured seed, and the amount of the

lisease increased and the yield decreased with an increase in the degree of seed injury. Mindum and Marquis wheat appeared equally affected by seed injury.

Breeding for smut resistance in Arizona-grown wheat, W. E. Bryan (*Arizona Sta. Tech. Bul. 66 (1937), pp. 93–123, figs. 4*).—The need for this investigation is based on the fact that the commercial varieties most resistant to *Tilletia tritici* and *T. laevis* are not adapted to Arizona conditions, so that the best use that can be made of them is in crosses with adapted varieties followed by selection in the attempt to isolate new resistant varieties adapted to the State. The data presented are based on studies as to the manner of inheritance of smut resistance and the suitability of a breeding technic for separating the resistant and susceptible forms in the segregating progenies. For this purpose about 2,000 hybrid progenies of the third and later generations consisting of more than 80,000 individual plants were used, for which the 3 resistant varieties Hussar, Ridit, and Hope and the susceptible varieties Sonora and Baart were taken as parents.

Under the experimental conditions it became apparent that a true distribution of the genotypes in a cross with regard to resistance and susceptibility could be determined only by repeated testing of progenies taken from all classes of F_3. The study has indicated the following necessary steps in breeding for smut resistance in crosses between resistant and susceptible sorts: (1) Selection of the resistant parent, (2) crossing it with the best standard varieties already adapted to the region, (3) growing a sufficiently large number of first- and second-generation hybrids to insure a large number of third-generation progenies, (4) inoculation of the seed of each F_2 plant used for growing the F_3 progenies, and (5) selection of individual plants from zero- and low-infection progenies of F_3 and later generations until immunity or high resistance has been fixed, with care exercised that the seed used in planting each progeny is thoroughly inoculated. The practical value of some of the most promising progenies derived from the crosses noted is briefly discussed.

Controlling damping-off in greenhouse and cold frame, J. G. Horsfall (*Farm Res. [New York State Sta.], 3 (1937), No. 3, p. 6*).—As a result of 2 years' tests at the station and in commercial greenhouses, red copper oxide spray (1–50) is recommended for control of postemergence damping-off as a valuable supplement to seed treatment with red copper oxide, zinc oxide, or organic mercury (depending on the crop concerned).

The use of bromine in the sterilization of fruits and seeds, C. D. La Rue (*Science, 85 (1937), No. 2204, p. 319*).—Bromine water diluated to one-tenth its original strength and poured over seeds or pieces of stems, roots, etc., in containers forthwith tightly stoppered proved effective. Oats were injured if exposed over ½ hr., but corn, cabbage, radish, and sunflower seeds withstood 1 hr. or more. Rinsing proved unnecessary.

Fruit and vegetable diseases on the Chicago market in 1935, G. B. Ramsey (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1937, Sup. 98, pp. 15*).—"These notes and data represent material collected by the writer from personal observations on the condition of fresh fruits and vegetables as they arrived on the Chicago market and information abstracted from over 2,000 certificates issued by the inspection service of the fruit and vegetable division of the Bureau of Agricultural Economics in Chicago." The hosts are arranged alphabetically by common names.

Market diseases of fruits and vegetables: Peaches, plums, cherries, and other stone fruits, D. H. Rose, D. F. Fisher, C. Brooks, and C. O. Bratley (*U. S. Dept. Agr., Misc. Pub. 228 (1937), pp. 27, pls. 11*).—This handbook is

designed "to aid in the recognition and identification of pathological conditions of economic importance affecting fruits and vegetables in the channels of marketing, to facilitate the market inspection of these food products, and to prevent losses from such conditions." It includes 6 colored plates and a list of 67 references to cited literature.

Black stem of alfalfa in Idaho, R. Remsberg and C. W. Hungerford (*Phytopathology, 26 (1936), No. 10, pp. 1015–1020, fig. 1*).—Studies at the Idaho Experiment Station indicate that this disease is identical with that reported by Johnson and Valleau (E. S. R., 70, p. 194) from Kentucky, the causal organism being *Phoma medicaginis*. The fungus, grown on sweetclover stems, produced an ascigerous stage corresponding to *Pleospora rehmiana*, which was found also on dead alfalfa stems from the field. Pycnidia of *Phoma medicaginis* were produced on alfalfa and sweetclover in moist chambers after inoculation with a culture of *Pleospora rehmiana*, which also produced typical black stem symptoms on alfalfa and sweetclover in the greenhouse. Reisolations yielded cultures of *Phoma medicaginis* identical with the original, proving that *Pleospora rehmiana* is the perfect stage of *Phoma medicaginis*. The ascospores function as inoculum for alfalfa in the spring.

The relationship of Cephalosporium acremonium to the black-bundle disease of corn, M. R. Harris (*Phytopathology, 26 (1936), No. 10, pp. 965–980, figs. 2*).—In studies with over 5,000 corn plants, stalks were inoculated by hypodermic needle at all stages of growth with a spore suspension of the fungus *C. acremonium*. A majority of these escaped infection. In a histological study of vascular bundles of various strains of corn, the black condition of the vascular bundles was found to be caused by a deposit of a gummy material containing pentoses, *C. acremonium* being present only occasionally but always associated with the gum. Cornstalks free of the black bundles could not be inoculated with the fungus. The black-bundle condition was found to be caused by unfavorable environmental conditions in some inbred strains of corn. In others it appeared to be a hereditary condition. In no case in which the fungus was isolated was there indication of active pathogenicity by attack through uninjured root systems or invasion of normal vascular elements, but in all instances it had apparently developed only after severe root injury in cornstalks where gum was already present in the bundles.

Resistance to bacterial wilt of open-pollinated varieties of sweet, dent, and flint corn, S. S. Ivanoff (*Jour. Agr. Res. [U. S.], 53 (1936), No. 12, pp. 917–926, figs. 2*).—In this study by the Wisconsin Experiment Station in which 92 sweet, 17 dent, and 11 flint corn varieties were tested for resistance by artificial inoculation with *Phytomonas stewarti*[*i*], great differences were found within each of the three varietal groups. There was a high correlation between resistance and height, resistance and lateness, and height and lateness within each varietal group. The dent varieties of a certain lateness and height proved no more resistant than sweet and flint varieties of the same lateness and height. It thus appears that resistance in open-pollinated field corn is similar in type and degree to that of the open-pollinated sweet and flint varieties.

Resistance to bacterial wilt of inbred strains and crosses of sweet corn, S. S. Ivanoff and A. J. Riker (*Jour. Agr. Res. [U. S.], 53 (1936), No. 12, pp. 927–954, figs. 8*).—The sweet corn tested for resistance to *Phytomonas stewarti*[*i*] in this study by the Wisconsin Experiment Station included approximately 1,000 inbred strains and 1,000 F_1 hybrids and top crosses of the Golden Bantam type inoculated by artificial puncture or spontaneously infected. The artificial method proved to be more advantageous for resistance tests.

Great differences in resistance were found among the inbred strains, as a rule the taller and later strains showing the greater resistance. The hybrids and top crosses also showed great differences, and their resistance was found to be inherited from the inbred parents. Resistant inbreds usually produced resistant hybrids and susceptible inbreds susceptible hybrids. As a rule, tall and late hybrids were more resistant than short and early hybrids. Hybrids originating from highly resistant inbreds generally showed high resistance regardless of their degree of earliness or lateness. Highly resistant hybrids were commonly late, though a few were early.

Resistance in the hybrids appeared to be generally dominant. Usually the crosses between resistant and susceptible inbreds gave resistant hybrids, crosses between susceptible inbreds and susceptible inbreds gave susceptible hybrids, and crosses between resistant inbreds and resistant inbreds gave resistant hybrids.

Concentration of ammonia necessary in a low-lime phase of Houston clay soil to kill the cotton root-rot fungus, Phymatotrichum omnivorum, D. C. NEAL and E. R. COLLINS (*Phytopathology, 26 (1936), No. 10, pp. 1030–1032*).—NH_3 added as NH_4OH to a low-lime phase of Houston clay soil was converted to nitrate fairly rapidly, 30 percent being nitrified after 26 days from applications in excess of 825 p. p. m. Therefore, when soils containing cotton root rot mycelium and sclerotia after adding ammonia in graded amounts are tested to determine what concentration is effective in killing the fungus, the concentration of free NH_3 obtained at the time of analysis in cultures where the fungus failed to grow cannot be considered as that effective in killing the fungus. Tests using shorter periods of incubation after treatment are held necessary to determine this. In the experiments here reported the effective initial concentration in the soil appeared to range from 900 to 1,025 p. p. m., in marked contrast to the lower concentrations reported from previous tests.

The organism causing the dry top rot of sugar cane, M. T. COOK (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 21 (1937), No. 1, pp. 85–97, pls. 3*).—The morphological, life history, and taxonomic data relating to the causal agent are summarized from the standpoints of the literature and the author's studies, on the basis of which it is believed that "this organism should be kept in the genus *Ligniera* or that there should be a merging of genera as suggested by [B. T.] Palm and [M.] Burk, in which it would become *Sorosphaera vascularum*." The method of infection has not yet been definitely determined. Differences in varietal susceptibility are noted, and the disease is said to be most severe in poorly drained soils. The most important method of distribution from place to place is by the seed cuttings.

Crystalline tobacco-mosaic virus protein, W. M. STANLEY (*Amer. Jour., Bot., 24 (1937), No. 2, pp. 59–68, figs. 2*).—This is a critical review of previous work on plant viruses (with 72 bibliographic references) and a summary of the author's studies of the virus of tobacco mosaic leading to the following general conclusions: "The fact that the crystalline protein from many different batches of starting material has the same chemical composition, isoelectric point, optical rotation, and biological activity, and that these properties remain constant during many recrystallizations and following drastic fractional crystallization, the fact that is was found impossible to separate the activity from the protein by means of filtration through collodion or other types of filters or by centrifugation of the high molecular weight protein from solution under a variety of conditions, the fact that the destruction spectrum of the virus activity (Duggar and Hollaender, 1934, 1936) [E. S. R., 76 p. 50] agrees essentially with the absorption spectrum of the protein, the homogeneity of the

protein with respect to size and isoelectric point, the isolation of the protein from plants distantly related to tobacco, the isolation of different proteins from plants diseased with different strains of tobacco-mosaic virus, and the fact that any change in the protein is accompanied by a change in virus activity are all indications that the virus activity is a property of the protein."

Since tobacco-mosaic virus has long been considered a representative virus, it seems likely that other viruses will be found to be proteins, and in view of the properties which this protein possesses the border line between the living and the nonliving tends to become nonexistent. It very possibly represents "a link between the type of organization within the atom or molecule with which chemists have concerned themselves and the type of organization within the cell with which biologists have been concerned. In any event, it now appears possible to list protein molecules along with living organisms, such as bacteria, fungi, and protozoa, as infectious disease-producing agents." These diseases may thus be regarded as disruptions of the normal metabolism caused by the production of virus protein.

Frenching of tobacco and thallium toxicity, E. L. Spencer (*Amer. Jour. Bot., 24 (1937), No. 1, pp. 16–24, figs. 2*).—When the toxic action of 33 different chemical elements on young seedlings of *Nicotiana tabacum* var. Turkish was studied, thallium was the only one that produced chlorosis in the youngest leaves and formed strap-shaped leaves resembling those in frenching. It produced chlorosis in tobacco in amounts as low as 0.067 p. p. m. in nutrient water cultures, 0.10 p. p. m. in sand, 0.38 p. p. m. in orchard soil (a light, sandy, nontoxic loam), and 0.25 p. p. m. in field soil (a heavy, clay loam which causes severe frenching). Thallium was more toxic to seedlings in sand when added with a water extract of this field soil than when added with the orchard-soil extract or with water alone. Although a water extract of the orchard soil in itself was nontoxic, the addition of a nontoxic concentration of thallium rendered it toxic, supplementing the activity of some principle already present in the soil (possibly thallium) sufficiently to produce chlorosis.

Species of *Nicotiana* susceptible to frenching were also found to be sensitive to thallium, and vice versa. Thallium-induced chlorosis was controlled by the addition of nitrogen salts, aluminum sulfate, and potassium iodide, all of which are effective in preventing frenching.

The evidence indicates a striking similarity between natural frenching and thallium toxicity in the symptoms they produce on Turkish tobacco and also with regard to the methods by which they are controlled. Final proof that these two diseases are identical requires the demonstration of the presence of toxic quantities of thallium in soils which produce frenching. At present it is questionable whether the known chemical methods are sufficiently sensitive to detect such small traces of thallium as these experiments have indicated must be present in the soil if frenching is a thallium-toxicity disease.

A strain of the virus which causes streak in tomato, G. H. Berkeley (*Canad. Jour. Res., 14 (1936), No. 12, Sect. C, pp. 419–424, pls. 3*).—"In this paper the symptoms of a strain of tomato streak virus 1 found in Ontario are described and are compared with those produced by tomato streak virus 1 and tobacco virus 1 on the same hosts. On tobacco, variety White Burley, Adcock, etc., the Ontario strain produces necrotic local lesions on rubbed leaves followed by systemic mottling, whereas tomato streak virus 1 generally produces necrotic local lesions only, though sometimes systemic necrosis may follow. Also, on *Nicotiana sylvestris* the Ontario strain gives rise to systemic mottling with necrosis following the primary necrotic local lesions, whereas

mato streak virus 1 produces primary necrotic local lesions with or without stemic necrosis.

"The fact that all varieties of tobacco do not react in a similar manner either tomato streak virus 1 or the Ontario strain is shown by a comparison of symptoms on Harrow Velvet (systemic mottling only) and White urley or Kelley (necrotic local lesions sometimes followed by systemic ecrosis). On the other hand, all varieties tested respond to inoculation with obacco virus 1 (tomato mosaic) by production of systemic mottling with some istortion. A series of inoculations on seven varieties of tobacco grown in the ield has shown that *N. tabacum* varieties Adcock, Gold Tip, White Burley, and Greenwood were killed within 2 weeks after inoculation with tomato streak virus 1, whereas the Ontario strain on the same varieties caused stunting with systemic mottling of leaf tissue but did not kill the plants.

"Tests as to reaction to aging and heat have demonstrated that tomato streak virus 1, the Ontario strain of this virus, and tobacco virus 1 have similar properties in that each is viable after 6 months' aging and each is rendered inactive after 10 min. at 90° C. Immunity tests show that tobacco virus 1 immunizes plants against infection with either tomato streak virus 1 or the Ontario strain of this virus. It is suggested, therefore, that tomato streak virus 1 and the Ontario strain of the virus may be strains of tobacco virus 1."

A possible new wilt disease of tomatoes, O. A. Reinking (*Farm Res.* [*New York State Sta.*], *3* (*1937*), *No. 3, pp. 12, 13, fig. 1*).—Studies (including successful inoculations) of a wilt disease observed in the hot, dry season of 1936 in the Rochester tomato area indicated it to be due to a new fungus differing from the ordinary *Fusarium* of tomato wilt and here given the provisional name *F. bulbigenum lycopersici* f. 1.

The effect of certain cultural and handling practices on the resistance of apples to Penicillium expansum, K. F. Baker and F. D. Heald (*Phytopathology*, *26* (*1936*), *No. 10, pp. 932–948*).—In tests at the Washington Experiment Station in which over 9,000 sound fruits were uniformly punctured, immersed in a suspension of blue mold spores, and stored at approximately 0° C., the rate of rot advance in Delicious and Winesap apples was slightly greater in fruit from fertilized than from unfertilized trees and in fruit picked at prime maturity than at early maturity. When fruit was coated with a paste of *P. expansum*-decayed apple pulp, then wrapped in oiled paper before storing, the number of lenticel infections per apple was greater in fruit picked at prime maturity than at early maturity, the Winesap showing more resistance to lenticel infection, as well as to spread in the flesh, than the Delicious. Fertilizer did not affect lenticel infection. The Jonathon variety developed more lenticel infection than the other two.

Recent investigations on the control of cedar-apple rust in the Hudson Valley, J. M. Hamilton (*New York State Sta. Bul. 678* (*1937*), *pp. 34, figs. 8*).—Brief reviews are given of the life histories of the fungi of apple rust (*Gymnosporangium juniperi-virginianae*), hawthorn rust (*G. globosum*), and quince rust (*G. clavipes*) as pertaining to an appreciation of the rust problem on apples in the Hudson Valley. The relative importance and status of these species for apple production in this area are considered. The danger from foliage infection by the apple rust fungus extends from the first of May to the latter part of June, and for apple fruit infection, for the most part, over the month of May.

The data presented are limited to field control trials for the apple rust fungus, data being recorded by infection periods. Commercial control was obtained

economically by fungicides and absolute control where no growth occurred between the spray application and the infection period. Lime-sulfur (1-100) gave commercial control. All wettable sulfurs gave satisfactory control under average conditions, but under adverse conditions those depositing the greatest sulfur residue were the most effective. Flotation sulfur in the paste form and sulfurs plus amendments to promote adhesiveness appeared most promising. The finer sulfurs (particle size of 5μ or less) that spread well and had but little run-off were most effective, depending partly on the concentration. Bordeaux mixture (2-3-100) was effective, but two proprietary copper substitutes, at the concentrations used, were not. Timeliness and thoroughness were obviously vital factors and apparently were more important than the concentration of the materials.

Suggestions are given for adapting the experimental results to commercial practice, especially for combined apple rust and scab control. Where effective spray equipment is unavailable and the alternate host cannot be reduced to a minimum, substitution of rust-resistant varieties of apples is recommended.

Mottle-leaf and sun-blotch disease control, E. R. Parker (*Calif. Avocado Assoc. Yearbook, 1936, pp. 149-151*).—Tests at the California Citrus Experiment Station have shown that spraying with zinc compounds gives a favorable response in avocado trees affected with mottle-leaf. Sun-blotch of avocado trees is shown to be a virus disease capable of propagation by budding and grafting, but no evidence of other means of propagation has thus far been found. Preventive measures are outlined. As to pruning methods, the likelihood of success appears to depend on the amount of affected tissue and the severity of the pruning necessary.

Sweet orange fruit scab caused by Elsinoë australis, A. A. Bitancourt and A. E. Jenkins (*Jour. Agr. Res. [U. S.], 54 (1937), No. 1, pp. 1-18, pls. 13, fig. 1*).—Sweet orange fruit scab, as yet identified only in South America, affects the following varieties of *Citrus sinensis:* Abacaxi, Bahia Navel, Criolla, Lima, Mangaratiba, Pera, Ruby Blood, Sabará, Selecta, Santos, São Sebastião, Sweet Mediterranean, and Valencia. Other kinds of citrus affected are the tangerine of Brazil (*C. nobilis* var.), a sweet lime known as "lima da Persia" (*C. aurantifolia*), a sour lime known as "limão seda" (*C. aurantifolia*), "laranja cravo" (*Citrus* sp., probably a variety of *C. nobilis*), and a pointed-leaf papeda (*C. hystrix?*), the last two named being also susceptible to sour orange scab. The disease has been identified from Argentina, Paraguay, Uruguay (apparently), and Brazil, where it is found more or less widely distributed in the States of São Paulo, Rio Grande do Sul, Rio de Janeiro, Minas Geraes (one locality), and in the Federal District. The earliest records are from Paraguay (1882), São Paulo (1900, apparently), and Rio Grande do Sul (1923). The disease, which may be controlled by spraying, is of economic importance particularly because it blemishes the fruit. It affects the leaves and twigs more rarely. In its symptoms (described) it has the general aspect of our "sour orange scab" caused by *E. fawcetti*, although there are appreciable differences in the lesions.

The taxonomy of the perfect and imperfect stages of the fungus has been previously noted (E. S. R., 76, p. 498). Saltations may be produced, and these have been isolated and cultured separately. At constant temperatures between 3.5° and 39.5° C., both *E. australis* and *E. fawcetti* grew from 9.5° to 35°, the optimum for *E. australis* occurring at 24.5°-29° (probably being near 26°) and for *E. fawcetti* at 20°-24.5° (probably near 21°). In inoculation experiments, *E. australis* from sweet orange gave positive results on sweet orange, tangerine, and laranja cravo and was reisolated. *E. fawcetti* infected laranja

cravo and sour orange, but not sweet orange. Cross-inoculations on citrus with *Sphaceloma perseae* and on avocado with *E. fawcetti* and *E. australis* gave negative results.

A disporous Gnomonia on pecan, J. B. DEMAREE and J. R. COLE (*Phytopathology, 26 (1936), No. 10, pp. 1025–1029, figs. 2*).—In Georgia and Florida a *Gnomonia* produces necrotic spots on living leaves of the pecan (*Hicoria pecan*), the lesions first appearing in June and mature perithecia about 1 mo. later. Two spores are commonly formed in each ascus, but occasionally one, and less often three or four. A conidial stage has not been observed. The fungus is considered only a minor one on pecans and is frequently associated with rosette, a zinc-deficiency disease. To distinguish this species of *Gnomonia* from others reported on *Hicoria*, two of which cause destructive diseases of pecans, the name *G. dispora* n. sp. is proposed. It was observed on other species of *Hicoria*. In pure culture it developed typical perithecia, asci, and ascospores.

Leaf blight of China aster caused by Rhizoctonia solani, A. J. ULLSTRUP (*Phytopathology, 26 (1936), No. 10, pp. 981–990, figs. 3*).—A culture of *R. solani* was isolated from severely blighted leaves of China-asters growing in New Jersey under greenhouse conditions. A comparative study was made between this isolate and one from potato and three from sugar beets. The isolate from China-aster could be differentiated from other isolates on the basis of more rapid growth rate at 35° C., growth on certain agar media, and its high pathogenicity on various host plants. The culture obtained from China-aster, together with one isolate from sugar beet, penetrated directly uninjured cuticularized epidermal cells, while other isolates penetrated only through stomata or not at all. Cross-inoculations indicated no marked host specialization between the different isolates.

Rhododrendron wilt and root rot, R. P. WHITE (*New Jersey Stas. Bul. 615 (1937), pp. 32, figs. 18*).—Rhododendron wilt, caused by *Phytophthora cambivora* (=*P. cinnamomi*) is reported to be the most serious disease of juvenile rhododendrons known. *Rhododendron ponticum*, widely used as an understock for grafting, is the most susceptible species tested, although none of the natives were resistant to inoculations.

Yellowing of the foliage, wilting, decay of roots, and brown, sunken cankers on the current season's growth are characteristic. The phloem and cambium are invaded in stems older than 1 yr., but the xylem is not invaded until after the plant dies. On current season's growth the fungus spreads inter- and intracellularly into the cortex, through the medullary rays and into the pith, and out the leaf petioles into the lamina of the leaf.

Inoculations were successful through roots, growth cracks in the basal portion of stems, uninjured lower surfaces of leaves, and through injuries to above ground stem parts. On the basis of the pathogenicity tests, there seem to be three distinct strains of the fungus. An optimum temperature of 25°–27.5° C. held for all strains, but one isolate showed a consistently greater tolerance to high (35°) and low (5°) temperatures than all others. The rhododendron isolate had a tolerance to acidity of pH 4.25+. *R. ponticum* has shown better growth at pH 4.25 than at lower acidities. In highly organic soils *R. ponticum* grows most rapidly when the soil is adjusted to 60–70 percent of its water-holding capacity. Disease prevalence is greater in soils of higher soil moisture contents, first evidences of wilt due to inoculation of the roots occurring on plants growing in soils kept above 70 percent of their water-holding capacity. Except for one isolate, the fungus was killed by long ex-

posures to low winter temperatures normally experienced at 4- and 6-in. soil depths at New Brunswick. Soil known to be infested was freed by exposure to the same temperatures.

Control may be effected by strict daily roguing of field frames, avoiding excess irrigation, providing proper soil acidity for growth of the host, preventing root decline due to becoming pot-bound, providing partial shade and mulch for young plants, and allowing the outdoor soil to freeze as deeply as possible during winter.

Cephalosporium wilt of elms, D. B. CREAGER (*Natl. Shade Tree Conf. Proc., 12 (1936), pp. 140–144*).—Since June 1934 this wilt or die-back has been studied intensively at the Arnold Arboretum. The symptoms are described. The causal fungus produces naked spore heads of the *Cephalosporium* type and pycnidia characteristic of *Dothiorella*, to which it has been referred as *D. ulmi*. Entrance of the fungus commonly takes place through wounds made by leaf-eating insects. Overwintering pycnidia in the bark of dead branches produce abundant viable spores the following spring.

Recommended control measures comprise the exclusion of infected trees from plantings and nurseries, careful pruning of light infections, eradication of all bad cases, and protection from injuries as far as possible by combined fungicidal-insecticidal sprays.

Verticillium root disease of American elms, L. R. TEHON and H. L. JACOBS (*Natl. Shade Tree Conf. Proc., 12 (1936), pp. 128–139, fig. 1*).—A disease of American elms regarded as a native disease, characterized by distinctive symptoms and always resulting in the death of affected trees, has been known in the Ohio Valley for some years prior to 1927. It appears to occur always on ground once forested, and in soils at pH 8.0. *V. rhizophagum* was the fungus most consistently isolated from samples of roots from 12 affected trees. Reinoculations with this fungus indicated its ability to induce stunting and death of seedlings grown directly from seeds in test tubes and to reproduce the entire series of symptoms of the spontaneous disease in young potted elms under controlled conditions. Anatomical and histological studies showed essentially a parasitization and destruction of the most newly formed xylem, of the cambium, and of the newest phloem. The effect is in the nature of a root rot not to be confused with any of the wilt diseases. Treatments tending to stimulate new root growth and to establish a somewhat higher soil acidity proved futile.

The dissemination of Septoria acicola and the effect of grass fires on it in pine needles, A. F. VERRALL (*Phytopathology, 26 (1936), No. 10, pp. 1021–1024*).—Evidence from spore traps and from disease development on seedlings of *Pinus palustris* protected and unprotected from rain splashing from diseased seedlings in an epidemic area in Louisiana indicated that this needle blight of pine seedlings is chiefly disseminated by splashing raindrops. Heat from grass fires sufficient to kill leaf tissue was found to kill the *Septoria* in the tissue.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Some changes in the soil fauna associated with forest fires in the longleaf pine region, F. HEYWARD and A. N. TISSOT (*Ecology, 17 (1936), No. 4, pp. 659–666, fig. 1*).—Observations of animal signs and counts of the microfauna reported in this contribution from the U. S. D. A. Southern Forest Experiment Station and the Florida Experiment Station cooperating show that "the horizons of soils supporting dense, long-unburned longleaf pine forests offer an excellent habitat for a diversified soil fauna. This is in contrast

pine forests subjected to frequent fires, in which, instead of an A_0 horizon, a ground cover of herbaceous plants is present. Soils of unburned areas were riddled with holes and tunnels of small mammals and insects, a condition generally lacking on frequently burned areas. The A_0 horizon of unburned areas contained approximately 5 times as many microfaunal forms as the ground cover of burned areas. The top 2 in. of mineral soil of unburned areas contained 11 times more such animals than the corresponding soil depth from burned areas. In general, the same microfaunal groups were found in soils protected from fire as in soils exposed to periodic fires, although the total number in each was different. In general, earthworms were more numerous in soils from unburned areas. Mites were by far the most abundant group of microfauna, 93 percent of the animals in the soil from unburned areas belonging to this group. The diversified active soil fauna of the unburned areas is believed to be responsible for the penetrable and well-aerated soil typical of such areas. This is in striking contrast to the more compact, less porous soil of frequently burned areas in which animal activity is much less abundant."

Food habits of Iowa red foxes during a drought summer, P. L. ERRINGTON (*Ecology, 18 (1937), No. 1, pp. 53–61*).—Comparisons made by the Iowa Experiment Station of the food habits of red foxes (*Vulpes fulva*) in Iowa during the drought season of 1934 and the normal season of 1933, here presented, are based upon data obtained from the examination of 1,010 food items and 1,175 fecal samples from 113 breeding dens in 1933 (E. S. R., 74, p. 63) and 2,848 food items and 935 fecal samples from 200 dens in 1934. "From this material, the conclusion may be drawn that, of the chief types of food, the representation of rabbits, ground squirrels, passerine birds, and ring-necked pheasants was nearly the same in 1934 as in 1933; that the representation of mice dropped appreciably in 1934, coincident with a rise in representation of pocket gophers, domestic chickens, and insects (mainly such Coleoptera as *Phyllophaga*)."

Food habits of the red fox in Iowa: Management depends to a great extent on what fox eats, P. L. ERRINGTON (*Amer. Wildlife, 26 (1937), No. 1, pp. 5, 6, 13, fig. 1*).—A practical contribution based upon the work above noted.

A study of the winter activities of the mink, W. H. MARSHALL (*Jour. Mammal., 17 (1936), No. 4, pp. 382–392, figs. 3*).—A report is made of studies of *Mustela vison mink* conducted in Washtenaw County, Mich., during the months of December 1934 and January, February, and March 1935. The details are presented in tables and figures.

An ecological study of the mole, A. V. ARLTON (*Jour. Mammal., 17 (1936), No. 4, pp. 349–371, figs. 5*).—A study of the ecology of the mole, commenced in the eastern part of Iowa and continued in the vicinity of Lincoln, Nebr., is presented at some length, details being given in tables and figures. The contribution is presented with a list of 29 references to the literature.

The house rat, J. SILVER (*U. S. Dept. Agr. Circ. 423 (1937), pp. 19, figs. 15*).—A practical account is given of the house or brown rat, its breeding and other habits, abundance, economic status, relation to health, and means of control.

Moisture and its relation to the cone-storing habit of the western pine squirrel, W. T. SHAW (*Jour. Mammal., 17 (1936), No. 4, pp. 337–349, figs. 7*).—An account based upon observations of species of *Sciurus* in western United States and a review of the literature is presented.

Food habits of a weasel family, P. L. ERRINGTON (*Jour. Mammal., 17 (1936), No. 4, pp. 406, 407*).—Observations of food habits of the weasel, probably *Mustela longicauda*, in Ruthven, Iowa, considered to give a fair idea of the

midsummer food habits of this weasel under the environment indicated, are briefly reported in this contribution from the Iowa Experiment Station.

American bird biographies, A. A. ALLEN (*Ithaca, N. Y.: Comstock Pub. Co., 1934, pp. IX+238, pls. 20, figs. 190*).—The life and habits of some 20 representative American birds are dealt with. The work includes 10 color plates and 10 wash drawings by G. M. Sutton.

The birds of Minnesota, I, II, T. S. ROBERTS (*Minneapolis: Univ. Minn. Press; London: Oxford Univ. Press, 1936, 2. ed., rev., vols. 1, pp. XXVI+718, pls. 50, figs. [305]; 2, pp. XVII+850, pls. 42, figs. 308*).—This is said to be a thorough revision (E. S. R., 68, p. 64), new material bringing the work as nearly up to date as possible. Minor changes, such as dates of migration and nesting, have been inserted in the original text. More extensive alterations and new material have been added in the form of an appendix to each volume, textual references being made to all such changes and additions. The pagination has been continued through the appendixes. The general index at the end of the second volume has been completely rewritten.

The thrushes and mimids of New Jersey, L. A. HAUSMAN (*New Jersey Stas. Bul. 618 (1937), pp. 32, figs. 28*).—This, the ninth in the series of birds native to New Jersey and found generally distributed over the northeastern part of the United States (E. S. R., 75, p. 511), treats of eight native thrushes and of the catbird, brown thrasher, and mockingbird of the family Mimidae (referred to as mimics or mimids), which are closely allied in structure. A chart comparing the dietaries of the six thrushes of the genus *Hylocichla*, a chart of their chief foods, a figure showing their breeding grounds in northeastern North America, and a plate illustrating the six species are included. Wild fruits, beetles, ants, and caterpillars are their principal food supply.

Ancient records of birds from the island of St. Croix, with observations on extinct and living birds of Puerto Rico, A. WETMORE (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 21 (1937), No. 1, pp. 5–16, pl. 1*).—Twenty-three species of birds identified from bones in a kitchen midden excavated on St. Croix in the Virgin Islands during the summer of 1934 are reported upon, supplemented by information on Puerto Rican forms. A description of one new species is included.

Studies of the nesting activities of Latimer's vireo (Vireo latimeri Baird), N. G. SPAULDING (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 21 (1937), No. 1, pp. 17–28, pls. 3*).—Observations of the nesting activities of *V. latimeri*, made at Algarrobo on the north coast of Puerto Rico, are reported. The data given relate to its song, call notes, territorial occurrence, nest, eggs, incubation, rearing of young, and the behavior of the male upon destruction of mate and young.

The development of the giant Surinam toad (Bufo marinus L.), F. SEÍN, JR. (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 21 (1937), No. 1, pp. 77, 78, figs. 3*).—A tadpole, from a strand of eggs of the giant toad collected in a brook at Monacillos, Rio Piedras, P. R., on April 20, 1934, developed to the adult stage on October 3, 1934, a period of nearly 6 mo. from collection.

What the giant Surinam toad (Bufo marinus L.) is eating now in Puerto Rico, G. N. WOLCOTT (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 21 (1937), No. 1, pp. 79–84*).—A comparison is made of the food habits of the giant toad based upon studies of the contents of pellets of excrement collected in 1935 and 1936 with the findings of Dexter (300 toads from 18 localities) in 1931 (E. S. R., 70, p. 357), at a time when the toad had presumably attained its maximum abundance in Puerto Rico. It is concluded that, while no decided change in the food of this toad has occurred in recent years due to the increasing

scarcity of May beetles resulting from its activities, the even greater scarcity of some of the other insects and other animals previously eaten leads to an even more exclusive selection of the adults of white grubs for its food. Thus the introduction of this toad into Puerto Rico for the control of white grubs was not only an immediate and temporary success, but tends, at least so far as the food habits of the toad determine its trend, continually to become more effective and more permanent.

On the potential longevity of various helminths with a record for a species of Trichostrongylus in man, J. H. Sandground (*Jour. Parasitol., 22 (1936), No. 5, pp. 464–470*).—In his treatment of this subject, the author considers trematodes, cestodes, and nematodes.

Studies on the endoparasitic fauna of Trinidad mammals.—IV, Further parasites from Trinidad deer, T. W. M. Cameron (*Canad. Jour. Res., 14 (1936), No. 11, Sect. D, pp. 165–167, fig. 1*).—In this continuation (E. S. R., 75, p. 654) of the author's studies, the trematode *Paramphistomum cotylophorum* is recorded from the Trinidad deer *Mazama simplicicornis*, and the female of the nematode *Eucyathostomum longesubulatum* from the deer is described.

On the fourth stage larva of Chabertia ovina, H. J. Griffiths (*Canad. Jour. Res., 14 (1936), No. 11, Sect. D, pp. 168–171, figs. 5*).—The structure of the early fourth-stage larva of *C. ovina*, an important nematode parasite of ruminants, is described in detail.

Experimental studies of factors influencing the development of the eggs of pig ascarid (Ascaris suum Goeze), G. C. Huff (*Jour. Parasitol., 22 (1936), No. 5, pp. 455–463, figs. 2*).—The author found that while the removal of the albuminous coating characteristic of the eggs of ascarids has no visible effect on development of ova at 30° C., it makes possible the development at 38° of 87 percent of the eggs through the tadpole stage and about 11 percent of the eggs to become embryonated. It is concluded that the role of the development of albumin is underestimated, since it modifies oxygen uptake significantly at optimum temperatures and is at least partially responsible for failure of the eggs to develop at temperatures around 38°.

General entomology, R. A. Wardle (*Philadelphia: P. Blakiston's Son & Co., 1936, pp. VII+311, figs. 96*).—An elementary text.

Studies on the freezing process in insects, R. W. Salt (*Minnesota Sta. Tech. Bul. 116 (1936), pp. 41, figs. 3*).—The importance of low temperatures in limiting the distribution and abundance of insects which must undergo a period of hibernation led to a study of some of the more fundamental problems of insect freezing, particularly with a view to clarifying the physical concepts involved. The insects used in the experimental work, representative of several types, were found to exhibit a considerable variation in the effect that desiccation or other change in water content has on their undercooling points. Puparia of the housefly lost 4 percent of their weight when exposed to warm, dry laboratory conditions for several hours, while their undercooling points dropped from −12° to −22° C. Adults of the boxelder bug, desiccated over calcium chloride at 2° and 20°, lost over 20 percent of their weight, while the undercooling points remained stationary. Larvae of the Mediterranean flour moth had almost the same percentage water content whether they were last instar feeding larvae, early prepupal larvae, or prepupal larvae from cocoons, yet the undercooling points averaged −5.8°, −8°, and −21.3°, respectively. Hibernating Say's stinkbug increased in water content from 53 to 67 percent of their total weight when fed for 5 days, but the undercooling points remained unchanged.

The effects of moisture in contact with the body surface, usually in the form of ice, and the need for careful technic to eliminate this factor when not desired are pointed out. Contact moisture reduces and sometimes completely eliminates undercooling in many insects, while others are not affected by even a heavy coating of water or ice. The factors governing the action of contact moisture appear to be the extent and "quality" of the contact, the type of integument of the insect, and probably others. Soft-bodied insects such as dipterous and lepidopterous larvae are usually susceptible, although the heavily sclerotized wasps, *Polistes*, are also very susceptible to ice crystal inoculation. Larvae of *Lucilia sericata*, the housefly, the Mediterranean flour moth, the Indian meal moth, and *Phyllophaga* are all readily inoculated by contact moisture. The pupae are slightly harder to inoculate, exhibiting an apparent individual variation which probably depends more on the quality of the contact than on the insect. Eggs seem to be very resistant, those of the clear-winged grasshopper and the Angoumois grain moth were entirely so in spite of all efforts to inoculate them. Fully developed larvae of the forest tent caterpillar in the eggshell were also proof against inoculation. Larvae of *Eurycephalomyia myopaeformis*, on the other hand, exhibited a doubtful or very low susceptibility.

Three species of stored-product pests, Mediterranean flour moth, Angoumois grain moth, and black carpet beetle, were tested for the location of their minimum lethal temperatures. The variation of these temperatures is given in the form of maximum, minimum, and mean lethal low temperatures. The complete life cycle of *Ephestia*, most of the stages of *Sitotroga*, and the larvae, pupae, and adults of *Attagenus* were studied. A temperature of −27° kills all stages of *Ephestia*, and −27.5° all stages of *Sitotroga*. The most resistant stage in each case is the newly hatched unfed larva. The first feeding of these larvae lessens their cold resistance so effectively that they are then in the least resistant stage. There seems to be evidence that this is a rather general phenomenon in insects, at least of certain types. The forest tent caterpillar behaves similarly. The food ingested by the newly hatched larvae of this species as they chew their way out of the eggshell raises their undercooling points more than 20°. It is suggested that this may give important clues in investigations on the factors involved in undercooling, whether such investigations are of a biological or physical nature. The quantity factor of cold, effective on many insects infesting stored products, was tested with the object of determining whether it could act in a short enough period of time to affect experiments designed for the study of the intensity factor alone.

In the case of insects that can withstand freezing, the minimum lethal temperature is lower than the undercooling point and may be very simply determined by test exposures. For insects that are killed by freezing, the undercooling point is the all-important minimum lethal temperature. If the insect is dry or immune to inoculation by contact moisture, then it is the normal undercooling point that is important. If the insect is inoculated by contact moisture, undercooling is limited, and a new and higher undercooling point is observed. The location of this new point is dependent on many factors, and may even coincide with the freezing point, in which case undercooling is nil. In any case it becomes the minimum lethal temperature for that particular insect.

A list of 40 references to the literature is included.

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1936, E-398, pp. 10, pls. 2; 1937, E-399, pp. 11; E-400, pp. 6; E-401, pp. 2; E-402, pp. 165; E-403, pp. 5*).—The

following contributions are in continuation of this series (E. S. R., 76, p. 655): Plant Poisoning of Bees, by C. E. Burnside and G. H. Vansell (E–398); The Use of Phenothiazine as an Insecticide, by L. E. Smith (E–399); Summary of Experiments With Derris and Cube Against the Pea Aphid During the Season of 1936, by J. E. Dudley, Jr., T. E. Bronson, and F. E. Carroll (E–400) (E. S. R., 75, p. 77); The Southern Buffalo Gnat [*Eusimulium pecuarum* Riley] (E–401); *Tephrosia* as an Insecticide: A review of the Literature, by R. C. Roark (E–402); and The Black Hills Beetle, by J. A. Beal (E–403).

[**Work in entomology by the Delaware Station**] (*Delaware Sta. Bul. 205 (1936), pp. 26–34, 38, 39*).—Following a brief reference to the occurrence of several important insects of the year (E. S. R., 76, p. 655), which includes 10 species of *Phyllophaga*, the lesser peach borer, *Lyctus planicollis* Lec., the periodical cicada, strawberry weevil, carrot beetle, *Scolytus multistriatus* Marsh., and the Japanese beetle, by L. A. Stearns, reference is made to studies of the bionomics and control of the codling moth, by Stearns, H. G. Guy, and P. L. Rice, and a study to determine the factors responsible for the development of one and two annual broods of the plum curculio, by Stearns; the bionomics and control of the oriental fruit moth, by Rice and Stearns; biology and control of the Tabanidae of Delaware, by A. M. Pearson, Stearns, and J. B. Schmitt; mosquito investigations, by D. MacCreary, Stearns, and F. C. Daigh; and destruction of *Macropsis trimaculata* by spiders, by T. F. Manns and F. R. Davies.

[**Report of work in entomology and economic zoology by the Iowa Station**] (*Iowa Sta. Rpt. 1936, pts. 1, pp. 126–141, figs. 6; 2, pp. 52–54*).—Included in the work of the year (E. S. R., 75, p. 77) referred to in part 1 are studies on the influence of meteorological factors upon honey production, stock replacement in honeybees, the races of bees, and factors involved in the transformation of nectar into honey by the honeybees, all by O. W. Park; variation in resistance to American foulbrood in honeybees, by Park, F. B. Paddock, and F. C. Pellett; wheat insect pest (hessian fly) survey, biology and control of onion insects, and survey of potato insects, all by C. J. Drake; nicotine-like compounds as insecticides, by C. H. Richardson; poisons affecting and distribution of injurious grasshoppers and emergency insect investigations, both by Drake and Richardson; bionomics and control of the codling moth, apple maggot, and other orchard insects, by Richardson and T. R. Hansberry; ecology of native wild ducks, semi-domesticated mallard ducks, and pheasants, food habits of avian and mammalian predators, analysis of environmental carrying capacity for wintering bobwhite quail, and ecology of the muskrat, all by P. L. Errington; and quail management, by L. J. Bennett.

Part 2 reports on white grub (principally *Phyllophaga implicita* (Horn)) investigations, by Drake and E. V. Collins; cornstalk borers and the ecology and control of sod webworms in permanent pasture and cultivated fields, both by G. C. Decker; and the bionomics and control of the chinch bug, by Drake, Richardson, and Decker.

[**Work in entomology by the New Mexico Station**] (*New Mexico Sta. Rpt. 1936, pp. 41–44, 45, 46, 49, 50*).—The activities of the year referred to (E. S. R., 75, p. 77) include insecticide and trapping experiments with the codling moth; insecticide control work with the potato psyllid and potato leafhopper, the onion thrips, false chinch bug, and harlequin bug; the occurrence of the beet leafhopper; and spray residue determinations on applies.

[**Studies of economic insects in India**] (*Indian Forest Rec., n. ser., Ent., 1 (1936), No. 13, pp. [5]+243–318, figs. 3; 2 (1936), Nos. 1, pp. 98, pls. 9, figs. 2; 2, pp. 99–113, pls. 2; 3, pp. [1]+115–124; 4, pp. 127–140; 5, pp. 141–149, fig. 1;*

6, pp. [1]+151–156, Eng. abs.; 7, pp. [1]+157–175; 8, pp. [1]+177–180; 9, pp. [1]+181–202, pls. 4; 2 (1937), No. 10, pp. [1]+203–206, figs. 2, Eng. abs.; 2 (1936), No. 11, pp. [1]+207–221; 2 (1937), No. 12, pp. [1]+223–323, pls. 3, figs. 19).—The contributions presented are as follows: Entomological Investigations on the Spike Disease of Sandal—27, Chrysomelidae (Col.), by N. C. Chatterjee and G. D. Bhasin (E. S. R., 75, p. 813), and 28, Cicadidae (Homopt.), 29, Coreidae and Berytidae (Hemipt.), and 30, Reduviidae (Hemipt.), all by N. C. Chatterjee; A Survey of the Damage to Teak Timber by the Beehole Borer *Xyleutes ceramica* Wlk. Throughout the Main Teak-Bearing Forests of Burma (Lepidoptera, Cossidae), by D. J. Atkinson; Immature Stages of Indian Coleoptera—19, Anthribidae (E. S. R., 75, p. 79) and 20, Carabidae, both by J. C. M. Gardner; New Indian Cerambycidae, by J. C. M. Gardner; New Indian Tingitidae (Hemiptera), by C. J. Drake and M. E. Poor; Two New *Callirrhipis* [*C.* (*Parennometes*) *incerta* n. sp. and *C. robusta indica* n. ssp.] and Their Larvae (Sandalidae, Col.) [trans. title], by F. Van Emden; Some New Carabidae From India, by H. E. Andrewes; New Species of Brenthidae and Lycidae From India (Col.), by R. Kleine; and On the Biology of the Bostrychidae (Coleopt.), by C. F. C. Beeson and B. M. Bhâtia.

[Contributions on entomological technic] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., 1936, ET–84, pp. 7, pls. 3; ET–85, pp. 2; ET–86, pp. 3; ET–87, pp. 2, pls. 2; ET–88, pp. 2; ET–89, p. 1; ET–90, pp. 2, pl. 1; ET–91, p. 1; ET–92, p. 1, pl. 1; ET–93, pp. 2, pls. 2*).—Further contributions (E. S. R., 75, p. 655) are Rearing the Cigarette Beetle for Experimental Use, by E. M. Livingstone, W. D. Reed, and A. W. Morrill, Jr. (ET–84); A Method for the Examination of Hibernating Insects [*Ephestia figulilella* Greg. and the Indian-Meal Moth] in Cocoons and Webbing, by H. C. Donohoe (ET–85); A Method of Evaluating the Relative Efficiency of Insecticides Used in Field Tests Against Tobacco Hornworms, by F. S. Chamberlin and A. W. Morrill, Jr. (ET–86); Labels for Marking Experimental Trees, by H. Spencer and M. Osburn (ET–87); A Method of Rearing *Cochliomyia americana* C. and P. on Artificial Media, by R. Melvin and R. C. Bushland (ET–88); A Graphite Stamp Pad for Temporary Marking, by C. E. Woodworth (ET–89); An Inexpensive Hot-Wire Glass Cutter, by R. A. Fulton (ET–90); An Agar-Sugar Preparation Used as Food in Parasite Shipping Cages, by J. K. Holloway (ET–91); A Pressure Sprayer for Handling Small Quantities of Material, by G. W. Barber (ET–92); and An Improved Apparatus for Mixing Insecticidal Dusts, by T. E. Bronson (ET–93).

Technique for rearing subterranean insects, H. R. Bryson (*Jour. Kans. Ent. Soc., 9 (1936), No. 3, pp. 73–84, pl. 1*).—In this contribution from the Kansas Experiment Station the problem of rearing insects which spend a portion or all the stages of their life cycles beneath the surface of the soil is dealt with. The contribution is presented with a list of 18 references to the literature.

The biological control of insects (with a chapter on weed control), H. L. Sweetman (*Ithaca, N. Y.: Comstock Pub. Co., 1936, pp. XII+461, [pl. 1], figs. [147]*).—This work, with a foreword by L. O. Howard, deals with the subject as follows: The theoretical basis of biological control (pp. 1–27); the use of (1) resistant hosts (pp. 28–44), (2) micro-organisms—bacteria and fungi (pp. 45–76) and viruses and protozoa (pp. 77–96), (3) parasitic invertebrate animals—Nemathelminthes (pp. 97–109) and Hexapoda (pp. 110–176), and (4) predatory invertebrate animals—Arachnida and Hexapoda (pp. 177–217); some biological relations of insect parasites and predators to their hosts (pp. 218–257); factors to be considered in the utilization of insect parasites and predators (pp. 258–288); the introduction of insect parasites and predators (pp. 289–317); the use of predatory vertebrate animals (pp. 318–339); the results of biological

control experiments against animals (pp. 340–358); and the biological control of pest plants (pp. 359–383). A glossary (pp. 384–389) and a list of references arranged alphabetically by chapters (pp. 390–420) are included.

Plant protection by the aid of therapeutants, G. H. Cunningham et al. (*Dunedin, New Zeal.: John McIndoe, 1935, pp. XXVI+243, pls. 4, figs. 23*).—Section 1 of this work deals with sprays and spraying (pp. 1–84), section 2 with dusts and dusting (pp. 85–94), section 3 with fumigants and fumigation (pp. 95–127), section 4 with disinfection of seeds, tubers, bulbs, and corms (pp. 128–152), section 5 with soil disinfection (pp. 153–176), and section 6 with miscellaneous measures (pp. 177–194). A glossary of terms, a bibliography of 26 pages, and a general index are included.

A study of arsenical dusting of cabbage in relation to poison residues, C. E. Smith, W. J. Reid, Jr., P. K. Harrison, and C. O. Bare (*U. S. Dept. Agr. Circ. 411 (1937), pp. 8, fig. 1*).—The results of 12 experiments, 6 in Charleston, S. C., and 6 at Baton Rouge, La., during the seasons of 1932–33 and 1933–34 to determine the limitations imposed by residue on treatments with arsenicals in controlling worms on cabbage are reported, the details being given in 4 tables. Four dilutions of paris green and calcium arsenate and one of lead arsenate, using lime as a diluent, were employed in two or more of the experiments. "The rates per acre per application ranged from approximately 10 to 24 lb., the number of applications of the different insecticides ranged from 0 to 10, and the periods of time from last dusting to sampling ranged from 8 to 100 days. The samples for residue determination consisted of from 10 to 20 plants taken at random from each treatment and trimmed to conform to U. S. grade No. 1—except in one experiment in which the entire leaf growth was included for analysis, the stalks being cut just below the bottom leaf. The studies were conducted under various conditions of rainfall, temperature, and soil, and with three plant varieties."

It was shown that, "with intervals up to 30 days from the last arsenical application to marketing, cabbage may retain arsenical residues exceeding the legal tolerance of 0.01 grain of arsenic trioxide per pound of marketable product. The loose leaves surrounding the compact head carry the principal portion of these residues. The variety of cabbage and the quantity of rainfall also affect the residues of the harvested product. Excessive residues were found in these tests in nearly all instances where the samples were taken within 10 days after the last application of the arsenicals was made, in about 30 percent of the samples examined after about 20 days, but in less than 10 percent of the samples taken after 24 to 30 days. For periods of time exceeding 30 days no excessive residues were found during the course of these tests." The data obtained indicate that it is unsafe to apply arsenicals on cabbage after foliage becomes exposed that will be a part of the marketed product.

Toxicity of fruit sprays: A study of lead spray residues in Iowa-grown fruit, with reference to manifestations in consumers, R. H. Heeren and H. B. Funk (*Pub. Health Rpts. [U. S.], 52 (1937), No. 1, pp. 8–16*).—Report is made of a case of arsenic dermatitis in an individual who consumed apples covered with heavy spray residues. Examinations for lead in spray residues on Iowa apples of the 1935 crop showed a lead content generally below the maximum allowed by Federal regulations for apples entering into interstate commerce, although a higher lead content was found in two lots from Iowa orchards.

"Imported apples which were examined also showed a lead content much lower than the maximum amount permitted by interstate commerce regulations, with the exception of one lot from an Illinois orchard. Tests on apples from orchards receiving light sprays, as are customary in Iowa, show lower lead

determinations than do crops from districts receiving heavier sprays. The lack of increase of basophilic substances in the red blood corpuscles of individuals who ate sprayed apples regularly indicates that the amounts of lead ingested were not sufficient to produce signs of toxicity."

A list is given of 13 references to the literature.

Investigation of organic compounds as insecticides, H. G. Guy (*Delaware Sta. Bul. 206 (1937), pp. 60, figs. 10*).—The need for an effective substitute for lead arsenate nontoxic to man and the higher animals led to the work here reported. Continued through 3.5 yr., it resulted in the evaluation of approximately 1,000 compounds, some 800 of which were tested as stomach poison insecticides.

"In laboratory tests, representatives of five different chemical groups, namely, phosphoniums, coordinated chromium salts, thiazines, thiuram sulfides, and thiocarbamates, approached the efficiency of lead arsenate in insect control. Although several other compounds were comparable in toxicity to this insecticide, they injured plant foliage severely. Under Delaware field conditions, on the contrary, only the thiuram sulfides gave excellent insect control. (The thiocarbamates and phosphoniums have not been so tested.) The other compounds, in particular the thiazines, through possible modifications in their physical and chemical properties, may still be of commercial value as insecticides against specific insects on certain crops."

Thiuram sulfides act as repellents to chewing insects. Tetramethylthiuram monosulfides and tetramethylthiurum disulfide were more effective in this respect than either lead arsenate or hydrated lime, both in the laboratory and in the field. They should be of commercial value as repellents for the adult Japanese beetle, since they give excellent protection of foliage from attack by this insect without creating a conspicuous spray residue.

Observations on the effectiveness of some moth-proofing, chemical compounds, D. R. Musser (*Jour. Kans. Ent. Soc., 9 (1936), No. 4, pp. 116–125*).—Experimental work conducted with a view to determining the insecticidal values of various moth-proofing compounds, most of which are now used in some form or another against insects injurious to fabrics and were tested for control of the case-making and the webbing clothes moths and the black, common, and varied carpet beetles, is reported upon, the details being given in table form.

The results indicated that all of the compounds tested offer approximately complete protection to the treated fabrics against clothes moths and carpet beetles. In many cases this protection either caused directly the death of the insects confined within the treated samples or resulted in their starvation. Dry cleaning and washing removed a sufficient portion of the Steuben Chemical Compound and the sodium fluosilicate from the fabrics to permit the larvae to cause appreciable damage to them. Similar tests were not conducted with the other moth-proofing compounds used. The results of the dry cleaning and washing tests appear to indicate that guarantees or claims of protection for the life of the fabrics from clothes moths or carpet beetles upon one application of any particular moth-proofing compound are to be looked upon with suspicion. Complete immersion of the fabrics gave slightly better protection than the application of the moth-proofing solution as a spray. The application of moth-proofing solutions by means of immersion or with the aid of a power spraying machine is recommended. Fabrics of the finished type were damaged in the checks to a greater extent than the fabrics of the unfinished type.

"The toxic moth-proofing materials, which consist of the arsenical and fluorine compounds, usually killed the larvae of these clothes pests when feeding occurred. Although the moth-proofing solutions which contain an arsenical

compound are used very extensively at the present time by several moth-proofing concerns, these solutions should be applied with caution due to their toxic effects upon human beings.

"Larvae of the clothes moths were killed more quickly by the moth-proofing compounds tested than were the larvae of the various species of carpet beetles, the latter being apparently more resistant to the toxic or repellent effects of these compounds.

"From the results of the experiments, it appears that the general public could advantageously purchase sodium fluosilicate in bulk, prepare a saturated solution in distilled water, apply it thoroughly either by immersion or spraying, and obtain a high degree of success in the protection of clothing and carpets against these fabric pests."

Fall clean-up measures against scale insects and whitefly, J. R. WATSON (*Citrus Indus., 17 (1936), No. 10, pp. 18, 19*).—This is a practical contribution from the Florida Experiment Station.

Department of entomology, S. G. JARY and M. D. AUSTIN (*Jour. Southeast. Agr. Col., Wye, Kent, Nos. 37 (1936), pp. 9–14; 39 (1937), pp. 9–15*).—Notes on the occurrence of the more important pests and the results of experimental work are presented (E. S. R., 73, p. 206). That in No. 39 relates to control of the strawberry blossom weevil *Anthonomus rubi* and the black currant eelworm *Aphelenchoides ribes*, insect and allied pests of cultivated mushrooms, pyrethrum, weevils of the genus *Rhynchites*, control of the currant bud mite, and the value of *Aphelinus mali* as a parasite of the woolly apple aphid.

Additions to Hebard's list of Orthoptera of South Dakota, with observations on some previously recorded species, H. C. SEVERIN (*Jour. Kans. Ent. Soc., 9 (1936), No. 3, pp. 85–93*).—This contribution records and notes 17 species of Orthoptera occurring in South Dakota additional to those reported by M. Hebard in 1925.[2]

Differences in the resistance of the instars of a pentatomid bug to pyrethrum powder, F. B. NOTLEY (*Bul. Ent. Res., 27 (1936), No. 4, pp. 607–609, fig. 1*).—During the course of the testing of finely ground pyrethrum flowers as an insecticide for the control of *Antestia lineaticollis* Stål in coffee trees, the author observed that various instars showed different percentage death rates under the same conditions. The experiments which followed are briefly reported upon.

A new species of Nysius (Hem., Lygaeidae) from Tasmania, and notes on the economic importance of the genus, J. W. EVANS (*Bul. Ent. Res., 27 (1936), No. 4, pp. 673–676, fig. 1*).—Following a description of the new species *N. turneri*, a brief summary is given of the importance of the genus *Nysius* and their life history, habits, and control.

The toxicity of certain insecticides to the chinch bug, C. H. RICHARDSON, C. C. DEONIER, and W. A. SIMANTON (*Jour. Agr. Res. [U. S.], 54 (1937), No. 1, pp. 59–78, figs. 6*).—As a contribution from the Iowa Experiment Station, the results of a laboratory and a field investigation to determine the effectiveness of certain contact insecticides against the chinch bug are reported, the details being given in tables and graphs. In the laboratory five soaps (sodium oleate, sodium-base laundry soap, pure potassium oleate, commercial potassium oleate, and commercial potassium fish oil soap), two kerosene emulsions, nicotine, piperidine, pyrethrum extract, rotenone, and derris extracts were applied as sprays under standardized conditions to the various stages of the insect. In the field, three commercial soaps, several petroleum oil emulsions, nicotine sulfate, a preparation containing dipyridyls, pyrethrum extract, and rotenone and

[2] Acad. Nat. Sci. Phila. Proc., 77 (1925), pp. 33–155, figs. 3.

derris extracts were tested as sprays on chinch bugs in corn. Calcium cyanide, sodium fluoride, nicotine-bentonite mixture, anabasine-bentonite mixture, and powdered derris root were applied as dusts.

In the laboratory experiment laundry soap was the most toxic, no significant differences being found among the other soaps tested. The adult chinch bugs were generally more resistant than the younger forms. Kerosene emulsion at high oil concentrations was only mildly toxic; emulsions which contained naphthalene dissolved in the oil were more toxic. Nicotine was more toxic to the adults than to the younger stages. Piperidine was relatively nontoxic. Pyrethrum extract in dilute acetone solution was highly toxic on the basis of total pyrethrin content and about equal to derris extract when the concentration of the latter was expressed as rotenone. On the above-mentioned bases both pyrethrum extract and derris extract were much more toxic than rotenone, and the latter was almost nontoxic to adults and fifth-instar nymphs. There was no difference in toxicity between acetone and carbon tetrachloride extracts of derris.

In the application of sprays in the field laundry soap was no more effective than commercial potassium oleate or potassium fish oil soap. The former was less injurious to the plant, suggesting that soaps of the higher saturated fatty acids (palmitic and stearic) may be less toxic to the corn plant. The alkalinity of the soaps may also be a factor. Nicotine and pyrethrum extracts gave results in substantial accord with those of the laboratory. Rotenone was less effective in the field than in the laboratory, as were also the derris extracts. Dipyridyl oil was noninjurious to the plant at effective concentrations.

Of dusts applied in the field calcium cyanide was efficient only when the amounts were large enough to cause severe plant injury. The other materials used were valueless.

The approximate order of toxicity in the laboratory of the various materials tested based upon the median lethal concentrations for the adults was pyrethrins=derris extract (based on rotenone content)>nicotine>sodium-base laundry soap>other K and Na soaps>piperidine>kerosene-naphthalene emulsion>kerosene emulsion. Rotenone is not included because the toxicity data are insufficient.

A list of 45 references to the literature is included.

Land-improvement measures in relation to a possible control of the beet leafhopper and curly top, R. L. PIEMEISEL and J. C. CHAMBERLAIN (*U. S. Dept. Agr. Circ. 416 (1936), pp. 24, figs. 13*).—The data here presented, based upon reconnaissance surveys of weed hosts and leafhoppers throughout southern Idaho and on detailed studies of selected fields and plats, show that the application of certain land-improvement measures would result in a large measure of control of the beet leafhopper and the curly top disease that it transmits. This leafhopper is produced in economic numbers only on the weed host stands which grow on abandoned, weedy fallow, burned-over, or heavily grazed lands, and not in economically significant numbers on well-farmed lands and desert range in good condition.

"Under favorable conditions these weed hosts will ultimately be replaced by a combination of desert shrubs, perennial grasses, perennial herbs, and other plants that are not breeding hosts of the beet leafhopper. For the greater part of southern Idaho such complete re-establishment of native perennials is not necessary for the elimination of weed hosts, since downy chess, not a host, forms an intermediate stage. In favorable situations the replacement of weed hosts by downy chess takes place in about 5 yr. The portion of southern Idaho here considered is divided into three categories—the primary, secondary, and

potential areas. The primary areas are considered the most important leafhopper-breeding areas and are those needing the first efforts at rehabilitation. The beet leafhopper and curly top can be controlled provided that all lands not continuously farmed and well farmed can be restored to and maintained as good desert range. The measures proposed for the accomplishment of this are similar to those contemplated or now under way for purposes of land conservation and differ only in the results sought for, that is, the control of the leafhopper and curly top instead of increased forage or prevention of soil erosion. Unless present practices are corrected, an increase of the weedy areas, leafhopper populations, and curly top can be expected."

Spruce gall aphids in nursery and ornamental plantings, F. L. Gambrell (*Farm Res.* [*New York State Sta.*], *3* (*1937*), *No. 3, pp. 1, 5, figs. 3*).—The spruce aphid, which attacks principally Norway and white spruces but may be found to some extent on other species of spruce, previously reported upon (E. S. R., 73, p. 74), and the Sitka aphid, which occurs largely on Colorado blue spruce, on which it causes very definite injury, and is also present on Douglas fir during part of its life history, are considered, particularly as relates to their control. The Sitka aphid, which is more commonly found on trees in the home planting, has recently proved to be a pest in some commercial nurseries as well. Its life history is somewhat similar to that of the spruce aphid but is much more complicated, having both primary and alternating hosts, namely, the Colorado or Sitka spruces and Douglas fir.

Experiments conducted for the past several years are said to have clearly demonstrated that these aphids can be effectively controlled by one thorough application of any one of several mixtures described. Their application should be made during the dormant season, with a view to killing the immature aphids that overwinter on the bark. Ordinarily treatment can be made any time between the middle of October and the latter part of April that weather conditions permit.

New California Aphididae, E. O. Essig (*Pan-Pacific Ent.*, *12* (*1936*), *No. 2, pp. 65–72, figs. 4*).—Three species of Aphididae, including *Myzus langei*, taken on the under sides of the leaves of water cress near Sonora, Calif., and to which the name water cress aphid is given, are described as new.

The problem of black scale (Chrysomphalus ficus Ashm.) in Palestine, C. Schweig and A. Grunberg (*Bul. Ent. Res.*, *27* (*1936*), *No. 4, pp. 677–714, pl. 1, figs. 9*).—An extended account is given of studies of the biology and control of this scale in Palestine, detailed in tables and graphs.

Ecological observations upon the enemies of Cecropia, with particular reference to its hymenopterous parasites, F. L. Marsh (*Ecology*, *18* (*1937*), *No. 1, pp. 106–112, figs. 2*).—A study made of the feeding interrelationships existing between scattered clumps of black willow, boxelder, and wild cherry in an area near Summit, Ill., the *Cecropia* larvae with which they were heavily infested, and the involved chain of hymenopterous parasites and hyperparasites is reported upon.

Fruit-piercing Lepidoptera in Sierra Leone, E. Hargreaves (*Bul. Ent. Res.*, *27* (*1936*), *No. 4, pp. 589–605, figs. 6*).—Observations of the fruit-piercing Lepidoptera in Sierra Leone, where grapefruit, sweet orange, mandarine, tangerine, and sweet lime are affected in addition to cashew, mango, breadfruit, and jackfruit, are reported upon.

A ten year study of codling moth activity, R. L. Webster (*Washington Sta. Bul. 340* (*1936*), *pp. 40, figs. 22*).—A comparison made of codling moth activity in the Pacific Northwest commenced in 1926, in which year traps were first employed to determine the proper time of application of cover sprays, indicates

a wide range of variation from year to year. The records, details of which ar graphically presented in 22 charts, have shown worm damage in any orchar to depend largely on the initial infestation. "The greater the population (overwintering worms, other things being equal, the greater the damage. A increasing moth population has been accompanied by greater irregularity i moth emergence, especially between broods. Temperatures in May, influencin the extent of egg-laying and the development of first brood worms, are of grea importance in determining codling moth activity during the season. Tempera tures during both August and September determine the extent of second broo worm activity. Warm weather late in the season may counterbalance cool Ma temperatures, and vice versa. Low winter temperatures appear less importan than spring and summer temperatures. Low temperatures during the winte months were important during only 1 yr. in the 10-yr. period, i. e., in 1930. I this case May temperatures were also unfavorable. There is some correlatio between size of the apple crop and worm damage. In general, a light crop fol lowing a heavy one is subject to greater damage. Conversely, when a larg crop follows one much smaller, less injury may be anticipated. Peaks of motl emergence occur at practically the same times in Yakima, Wenatchee, an Omak. Little correlation exists between moth records obtained at Prosse when compared to those obtained at Yakima and Wenatchee."

The oriental peach moth in the Goulburn Valley (Vic.) (*Jour. Counci Sci. and Indus. Res. [Austral.], 9 (1936), No. 4, pp. 320, 321*).—Brief referenc is made to the oriental fruit moth, an outbreak of which occurred in 1933–3 and caused serious losses to the canned peach industry of the Goulburn Valle of Victoria. In 1934–35, "the loss was [from] 20 to 28 percent, but in th 1935–36 season the loss was estimated at [from] 50 to 52 percent, which wa almost as serious as the outbreak of 1933–34."

Although peaches are the chief fruits attacked by the moth, almond frui and twigs, apricot fruit, plum twigs, pears, and quinces are also attacked Reference is made to work with the fruit moth parasites *Macrocentrus an cylivorus* and *Glypta rufiscutellaris*, introduced from the United States in 1935

A method of testing oils and other chemical agents for killing mosquit larvae, J. CAUCHI, W. SELLERS, and J. D. BUNKALL (*Bul. Ent. Res., 27 (1936) No. 4, pp. 649–652*).—A description is given of a method devised by the authors

Studies on the higher Diptera of medical and veterinary importance.— The warble flies of the genus Hypoderma, W. S. PATTON (*Ann. Trop. Med. an Parasitol., 30 (1936), No. 4, pp. 453–468, figs. 12*).—A continuation of this con tribution (E. S. R., 76, p. 77), in which the diagnostic characters of th terminalia of both sexes of species, including the common cattle grub, *H. dian* Brauer, *H. tarandi* L., *H. crossi* Patton, and *H. aeratum* Austen, are describe and illustrated.

New or little-known species of West Indian "Tipulidae" (Diptera) L. I. C. P. ALEXANDER (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 20 (1936), No. 4 pp. 877–882, figs. 4*).—Two new species of crane flies from Puerto Rico, one fron Cuba, and one from the Bahamas are described.

The breeding media of some common flies, M. THOMSEN and O. HAMME (*Bul. Ent. Res., 27 (1936), No. 4, pp. 559–587, figs. 4*).—Observations of th breeding habits of the stablefly and the housefly on a large number of farm in Denmark, together with oviposition experiments conducted in 1933 an notes on the reactions of other species during experiments, are reported upo in this further contribution (E. S. R., 72, p. 664). The contribution is pre sented with a list of 34 references to the literature.

A comparative study of the first-instar larvae of the genus Sarcophaga (Calliphoridae, Diptera), with notes on the biology, E. F. KNIPLING (*Jour. Parasitol., 22 (1936), No. 5, pp. 417–454, pls. 5*).—Following an introductory account of the habits and life history, larval characters, and a general description, a comparative study of 24 species of *Sarcophaga* (Calliphoridae, Diptera) in the first larval instar is reported upon.

The growth stimulation of blow-fly larvae fed on fatigued frog muscle, II, G. P. SMITH (*Jour. Expt. Biol., 13 (1936), No. 3, pp. 249–252*).—It has previously been shown that blowfly larvae (*Calliphora erythrocephala*) fed on fatigued frog muscle grew to a size larger than controls fed on resting muscle (E. S. R., 69, p. 694). The author has now demonstrated that the growth-stimulating substance is thermolabile and that it passes from the contracting muscle into the blood stream. It does not accumulate in the liver. The bacterial flora is equally dense on resting and on fatigued muscle on which fly larvae have fed.

The currant and gooseberry maggot or yellow currant fly (Epochra canadensis Loew), S. C. JONES (*Oregon Sta. Circ. 121 (1937), pp. 11, figs. 10*).—This is a practical summary of information on the currant fruitfly, a serious pest of both currants and gooseberries in Oregon. Biological studies of this dipteran, with a chart illustrating its seasonal history on gooseberries in the Willamette Valley, and means of control are included.

The application of a poison bait spray consisting of arsenate of lead (2 oz.), cheap molasses (1 qt.), and water (3 gal.) is recommended as the most effective insecticidal treatment available. It is recommended that the first spray be applied within 1 week after the flies begin to emerge or when the gooseberries begin to set fruit, and followed at weekly intervals until a week before harvest, being repeated after every rain.

Coleoptera of an original prairie area in eastern Nebraska, D. B. WHELAN (*Jour. Kans. Ent. Soc., 9 (1936), No. 4, pp. 111–115*).—An annotated list is given of the Coleoptera collected from the vegetation of a 320-acre tract of original low and upland prairie located about 9 miles northwest of Lincoln, Nebr.

Distributional notes on Utah Coleoptera, II, G. F. KNOWLTON (*Jour. Kans. Ent. Soc., 9 (1936), Nos. 3, pp. 107, 108; 4, pp. 109–111*).—This is a further contribution on the distribution of Coleoptera in Utah (E. S. R., 72, p. 510), contributed from the Utah Experiment Station.

The Cicadellidae of Cuba, Z. P. METCALF and S. C. BRUNER (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 20 (1936), No. 4, pp. 915–973, pls. 6*).—Keys are given to the genera and species of Cicadellidae, of which no less than 32 forms are recorded from Cuba. Five genera (*Hortensia, Hadria, Ciminius, Arezzia,* and *Lucumius*) are erected, and 21 species and 2 varieties are described as new. A bibliography of 52 titles is included.

The furniture carpet beetle Anthrenus vorax Waterhouse, a pest of increasing importance in the United States, E. A. BACK and R. T. COTTON (*Ent. Soc. Wash. Proc., 38 (1936), No. 9, pp. 189–198, figs. 2*).—In addition to the three species of carpet beetles that are of major economic importance throughout the United States, due to their destructiveness to house furnishings, namely, the carpet beetle, the varied carpet beetle, and the black carpet beetle, there is a fourth species, the furniture carpet beetle *A. vorax*, which is practically unknown except in Washington, D. C. This Old World species, first collected in Augusta, Ga., in 1911, was observed at Washington, D. C., in 1915, where it has become thoroughly established and is today the most destructive of all the carpet beetle and fabric pests and the cause of considerable loss

to property owners. It has also made its appearance at isolated points in other eastern States, extending from New York to Florida.

A study of its life history has shown the female to lay from 37 to 96 eggs, sometimes as many as 57 eggs in one batch. "During warm summer weather at Washington eggs hatch in 10 to 15 days, and the complete life cycle or generation requires about 1 yr., with some individuals requiring 2 yr. The pupal stage lasts from 9 to 13 days in summer, and adults may live several months, although, if laying eggs, they usually die within 2 weeks. By far the greatest period of the insect's life is spent in the feeding or larval stage.

"This beetle is exceedingly destructive when it finds access to stored commodities. It is very fond of hair-filled furniture, brushes, and carpeting, but feeds on all kinds of animal substances. It does not normally feed on substances of vegetable origin, but sometimes injures cotton, linen, rayon, and jute fabrics and silk, and in fact almost anything edible that has become stained or polluted with animal excretions."

A list is given of 16 references to the literature.

The fir engraver beetle, a serious enemy of white fir and red fir, G. R. STRUBLE (*U. S. Dept. Agr. Circ. 419* (*1937*), *pp. 16, pls. 4, figs. 3*).—This contribution reports upon the hosts and distribution of *Scolytus ventralis* Lec., a major cause of widespread damage and destruction to forests of fir in the West, its life history and habits, seasonal generations, character of damage, host susceptibility and resistance, associated insects of secondary importance, insect enemies, and artificial control measures.

"From 1928 to 1930, and again in 1932, sporadic outbreaks of local nature appeared in California and Oregon, doing considerable damage to second-growth forests. White fir, lowland white fir, and California red fir are the preferred host trees, but occasional damage is done to Douglas fir, mountain hemlock, alpine fir, and Engelmann spruce. The range of *S. ventralis* is known to extend from British Columbia to New Mexico and east to the Rocky Mountains.

"The beetle kills or damages its host by cutting transverse egg galleries along the cambium layer, resulting in girdling of the trunk or in patches of dead cambium. The larvae mine separate channels at right angles to the egg gallery along the cambium layer, causing further damage. A fungus stain introduced by the beetle and found with every attack is apparently an important factor in insuring the success of the beetle, as it apparently assists in overcoming the resistance of the host.

"The length of the life cycle depends on prevailing temperatures at the altitude and latitude of the host trees. In the central Sierra Nevada one generation is produced each year at elevations between 4,500 and 6,000 ft., one generation every 2 yr. at elevations above 6,000 ft. on north exposures, and one and a partial second generation at elevations between 3,500 and 4,500 ft. on south exposures. The broods hibernate only in the larval stage. The egg stage and the pupal stage are completed within 10 to 14 days. Adults are in flight from June into September, the maximum number being found during July and August. Under normal conditions *S. ventralis* breeds in old or weakened trees, killing the tops or patches of cambium along the bole. . . .

"Trees weakened by the fir engraver beetle are often readily attacked and killed by several species of associated secondary insects. The cerambycid *Tetropium abietis* is the most important in this group. *S. ventralis* is held in check naturally by several species of parasitic and predaceous insect enemies whose numbers increase with the numerical increase of the beetle. Artificial control measures are limited because of the wide variation in kill and brood establish-

ment. Unless the broods in top-killed trees or in partially injured boles can also be destroyed, the benefit from destroying broods in trees killed is largely nullified. The most practical means of control is by felling, peeling the bark, and burning."

Prothetely in larvae of the confused flour beetle (Tribolium confusum Jacq. Duv.), M. J. Oosthuizen and H. H. Shepard (*Ann. Ent. Soc. Amer., 29 (1936), No. 2, pp. 268–272, fig. 1*).—A contribution from the Minnesota Experiment Station, presented with a list of 13 references to the literature.

The biology of Ips perturbatus Eichhoff, A. R. Gobeil (*Canad. Jour. Res., 14 (1936), No. 12, Sect. D, pp. 181–204, pl. 1, figs. 4*).—Studies made of the biology of the bark beetle *I. perturbatus* in the Gaspé Peninsula during the summers of 1933 and 1934 are reported upon, details being given in seven tables. This species, which generally breeds on trees killed by *Dendroctonus piceaperda* Hopk., was also found on white spruce dying from attacks of the European spruce sawfly (*Diprion polytomum* Hartig). There was found to be one complete generation a year in the Gaspé Peninsula, young adults leaving their host tree at the end of September and the beginning of October to hibernate in the ground, from which they emerge in the spring.

"Experiments show that the adult stage lasts nearly 2 yr. During their first complete summer as adults the females lay two sets of eggs. The following spring they lay a third set and die during the summer. There are [from] one to four egg tunnels per engraving. The average number of eggs per egg tunnel decreases with the increase in the number of females per engraving. Dissection of 500 beetles indicates that the two sexes are present in about equal proportions. Analysis of the results of a population study made on a white spruce representing 48 ft. of tree superficies attacked by *I. perturbatus* produced the following results: 2,448 egg tunnels, 22,512 young beetles, 58,800 egg niches, and a mortality rate of 58.33 percent. *Coeloides dendroctoni* Cushm. is the most important parasite of this species, but does not kill more than 5 percent of the larvae and pupae. No trace of woodpecker control was noticed."

The life history of "Diaprepes abbreviatus" L., at Rio Piedras, Puerto Rico, G. N. Wolcott (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 20 (1936), No. 4, pp. 883–914, figs. 7*).—Studies of the life history of the otiorhynchid beetle *D. abbreviatus* (the adults of which are known as "vaquitas"), conducted by the Puerto Rico College Experiment Station, are reported. Nurseries and young newly set citrus trees are much more often attacked (or at least the feeding of the adults is more obvious) than are the older trees. They feed almost exclusively on young tender foliage, but when exceptionally abundant they may attack also the older leaves. The beetles also feed on the leaves of many other kinds of trees, and in the case of *Andira inermis* at times cause complete defoliation. The roots are fed upon by the grubs.

The females lay about 5,000 eggs in as few as 2 mos., May and June, or in as many as 7 mo. at other times of the year, often living over twice as long as do the males after emergence from the soil. "The incubation period of all eggs is 7 days. Larvae attain full size in 2 to 4 mo. A diapause period is absolutely essential before pupation. The pupal period is about 2 weeks. Fully-formed adults remain within the pupal chamber for a variable period of weeks or months, the length of this period and that of the diapause period of the larva being subject to great variation. The great variation in the duration of the diapause period of the larva and before the emergence of the adult from the pupal cell in the ground permits some individuals to complete their

life cycle (hatching of eggs to first egg cluster laid by female, or to emergence of male from soil) in less than 8 mo., but for other individuals it may extend for 18 mo. (hatching of egg to last egg cluster laid by female, or to death of male).

"Deviation from a 1-yr. life cycle is of tremendous value to *D. abbreviatus* L. in enabling its eggs to escape attack by a common parasitic wasp, *Tetrastichus haitiensis* Gahan, which is most abundant during the late spring, but very scarce during autumn and winter."

A list is given of 21 references to the literature.

Host relationships of the larger apple curculio, Tachypterellus quadrigibbus magnus List, P. O. Ritcher (*Jour. Kans. Ent. Soc., 9 (1936), No. 3, pp. 94–99*).—This contribution from the Wisconsin Experiment Station deals with variations within the subspecies *T. quadrigibbus magnus* as it occurs on wild and cultivated hosts growing in the Kickapoo Valley apple district of Wisconsin. The fact that this curculio varies greatly in size is said to be due in large part to the fact that *Crataegus* produces small curculios and the cultivated apple large curculios. That there is much less transfer between the two hosts than might be expected is thought to result from the feeding and egg laying preferences and the sluggishness of the curculios.

The practical use of the sun in cowpea weevil control, R. R. Reppert and M. R. Bentley (*Jour. Kans. Ent. Soc., 9 (1936), No. 4, pp. 126–139*).—The experiments reported, the details of which are given in tables, have shown that exposure of cowpeas to open sunlight on a clear day with no wind blowing between the hours of 10 a. m. and 4 p. m. when shade temperatures are 98° F. or more, for a period of 75 min. or more, will result in the complete destruction of all stages of weevils that may be infesting them. A similar exposure continued for as long as 5 hr. is not seriously injurious to germination, provided the shade temperature is not greater than 100°. Exposure under the same conditions but covered with glass, for a period of 15 min., will result in the complete destruction of all stages of weevils that may be infesting them. When continued for as long as 1 hr. there is no serious injury to germination, provided the shade temperature is not greater than 96°. When continued for as long as 5 hr. the percentage of germination is considerably reduced but the vigor of the resulting plants is not impaired.

The Mexican cotton boll weevil, Anthonomus grandis Boheman, in Haiti, A. Audant and A. Occénad (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 21 (1937), No. 1, pp. 69–76, figs. 3*).—The bollweevil, supposed to have been introduced by accident into Haiti, probably in the personal effects of returned emigrants from Cuba or in commerce by boats from Texas, about 1932, first came to the attention of cotton growers close to Jacmel through the number of fallen squares noted in the crop of 1932–33, although the loss was not sufficiently severe to cause alarm at that time. During the following season the infestation spread to other regions, but it was so light as to attract little attention from the growers. By the end of January 1935 the crop was a complete loss in the Jacmel region, and by June 1935 the pest had become established to the north and east of Port-au-Prince and before the end of the harvest had reached the neighborhood of l'Arcahaie and the lower slopes of Morne à Cabrits. Up to the end of 1936 the regions of St. Marc and of the Plateau Central had remained free from the pest, under the protection of a very severe quarantine.

The extent of the losses caused the cotton crop in Haiti is considered at some length.

The ants of Puerto Rico, M. R. Smith (*Jour. Agr. Univ. Puerto Rico [Col. Sta.], 20 (1936), No. 4, pp. 819–875, figs. 19*).—Keys are given for the separation of the subfamilies and species of worker ants, together with notes on the characters, occurrence, food habits, etc., of 66 ant forms recognized as occurring in Puerto Rico. One species and one subspecies are described as new to science. The contribution is based upon work in Puerto Rico from July 1935 to June 1936. A review of the literature with a list of 17 references is included.

Descriptions and records of California Mutillidae, C. E. Mickel (*Pan-Pacific Ent., 12 (1936), No. 2, pp. 91–96*).—Descriptions of three new mutillid species are included in this contribution from the Minnesota Experiment Station.

Laboratory breeding of Ascogaster carpocapsae Vier., with notes on biology and larval morphology, H. R. Boyce (*Canad. Ent., 68 (1936), No. 11, pp. 241–246, figs. 9*).—As noted from a study made at the Dominion Parasite Laboratory at Belleville, Ontario, 9,849 adults of *A. carpocapsae* which were reared in the laboratory have been released in several areas in British Columbia to control the codling moth. It is pointed out that this species is widely distributed in Europe and eastern North America, where it parasitizes a number of lepidopterous forms. A short account is given of its biology, with a description of its several stages, chiefly as a comparison with studies made by earlier workers. The breeding technic is described in full, and a detailed account given of shipping methods and liberation areas. Recoveries are said to have been made from liberations in 1935 in an unsprayed orchard near Victoria.

ANIMAL PRODUCTION

Animal breeding plans, J. L. Lush (*Ames, Iowa: Collegiate Press, Inc., 1937, pp. VIII+350, figs. 41*).—This book is intended primarily as a text for college students in advanced animal breeding courses and deals with the means available for improving the heredity of farm animals, particularly stressing the possibilities and limitations of each method. The different sections deal with the background of animal breeding, genetic principles, breeding plans based on selection, on relationship, and on somatic likeness, other topics concerning breeding plans, reproduction, and general considerations.

[Livestock investigations in Delaware] (*Delaware Sta. Bul. 205 (1936), pp. 19–23*).—Data are reported continuing earlier work (E. S. R., 76, p. 668), including that on dried distillers' and dried brewers' grains for growing fattening pigs and forage crops for pigs, both by A. E. Tomhave, and the necessity of breeding for desirable factors in high egg production and viability, protein levels of rations in growing chicks, and germinated oats for laying pullets, all by Tomhave and C. W. Mumford.

[Livestock investigations in Iowa] (*Iowa Sta. Rpt. 1936, pts. 1, pp. 72, 73, 75, 76, 81, 82, 83–85, 88–92, 93, 94, 95, 96, fig. 1; 2, pp. 58, 59*).—Swine studies reported include the consequences of inbreeding Poland China hogs, by J. L. Lush and C. C. Culbertson; the value of the Danish Landrace breed in the development of improved strains of swine for American conditions, and the evaluation of swine breeding stock, both by Lush, Culbertson, M. D. Helser, F. J. Beard, B. H. Thomas, and J. A. Schultz; spring v. fall pigs, by Culbertson, A. L. Anderson, Helser, Beard, and Thomas; the relative efficiency of different sources of calcium for growing and fattening pigs, by Culbertson and Thomas; the relative efficiency of different types of corn for growing and

fattening pigs, by Culbertson, Anderson, and J. L. Robinson; and the influence of different amounts of soybeans and oil in the ration of swine upon the character and quality of body fat and lard, and upon the keeping quality of the lard, by Culbertson, Beard, Helser, Thomas, and J. H. Buchanan.

Other livestock studies yielded information on the preparation of roughages for draft colts, and factors involved in the production of colts, both by A. B. Caine; rations for finishing steer calves in dry lot, and the influence of sex and also the influence of menhaden oil and coconut oil on the quality and palatability of beef, both by Helser, Beard, Culbertson, and Thomas, with P. M. Nelson cooperating on the meats studies.

Poultry investigations gave results on the effect of diet on the quantity of vitamins A and D occurring in hens' eggs, by Thomas; the biological value of meat scrap and milk combinations for egg production, and the value of egg yolk and chicken fat as preventives of rickets and slipped tendons of chicks, both by E. W. Henderson; a comparison of avian growth rates, by Henderson and T. T. Milby; and the effect of various levels and sources of protein and inorganic elements in the ration upon slipped tendons in chicks and poults, caponizing turkeys, and artificial lights for turkeys, all by H. L. Wilcke, Henderson, C. Murray, and C. D. Lee.

[Livestock experiments in New Mexico] (*New Mexico Sta. Rpt. 1936, pp. 34–36, 66–69*).—Progress is reported on the investigations previously noted (E. S. R., 75, p. 87), including additional data on the importance of alfalfa hay in different proportions in replacing hegari fodder for fattening lambs and on the phosphorus and calcium content of the important livestock grazing forages in different sections of the State, and the influence of different range crops and rations on egg quality, production, and mortality.

The technical conditions of preparation and the biological value of fish meals [trans. title], N. J. Chlebnikow and A. F. Arsenjew (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 6, pp. 565–579; Eng. abs., p. 578*).—The effect of certain treatments in the process of preparing various fish meals on the biological value of the protein has been studied in trials with growing chicks. The use of fish meal containing up to 9.47 percent of salt and 7.15 percent of fat in the chick ration caused no disturbance in growth. The process of soaking decreased the vitamin B_2 potency of the meal but did not affect its protein value. On the basis of growth-promoting quality and biological value of the proteins, the meals were ranked as follows: (1) Herring meal, soaked and extracted; (2) herring meal, not soaked and not extracted; (3) herring meal, from fresh fish, extracted; and (4) herring meal, soaked, but not extracted. The three codfish meals tested all ranked below the herring meals.

The yield of crude and digestible nutrients from clover and meadow grass under different methods of conservation [trans. title], K. Baseler (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 6, pp. 509–544; Eng. abs., pp. 543, 544*).—In a series of digestion trials with wethers over a 2-yr. period, clover and meadow grass hay dried on various types of scaffolds or riders was practically equal in digestibility to silage (cold fermentation process) from the same source, providing the hay was free from mold and otherwise of good quality. Ensiling proved by far the most effective means of conserving the starch value and protein content present in the green feed, while of the drying methods the thin wire rider ranked first, followed by the trestle rider, the Allgäu cottage, and drying on the ground. Feeding trials with cows comparing the nutritive value of the silage and hay dried on trestle riders confirmed the results of the digestion trials.

Investigations on silage and A. I. V. fodder conservation [trans. title], H. ISAACHSEN, O. ULVESLI, and M. HUSBY (*Meld. Norges Landbr., Høiskole., 16 (1936), No. 3–5, pp. 309–360; Eng. abs., pp. 358, 359*).—This report summarizes several years' trials in preparing silage from grass and aftermath, comparing the keeping quality and composition of ordinary silage with those receiving additions of either mineral salt solutions (NaCl, Na_2HPO_4, and $CaCl_2$), sour whey, or hydrochloric acid (A. I. V. process). Results of trials with ordinary potato silage and A. I. V. potato silage are also noted. A complete tabulation of the composition of all lots and the percentage recovery of nutrients in the various lots of silage is presented.

In general, the nutritive values of the conserved fodders are high, ranging from 59 to 92 feed units per 100 kg of dry matter in the silage. Some ammonia was found in all silage samples, with the least amounts occurring in the A. I. V. lots. Organic acid contents varied widely, lactic acid ranging from 0.12 to 2.9 percent, and butyric acid, which was found in practically all samples, ranging from 0 to 1.2 percent.

Effect of method and rate of grazing on beef production and plant population of pastures at Beltsville, Md., M. A. HEIN and A. C. COOK (*U. S. Dept. Agr., Tech. Bul. 538 (1937), pp. 35, figs. 16*).—Three similar permanent pasture areas seeded with a complex mixture in 1928 were grazed with beef steers for 6 seasons (1929–34) under different methods and rates of grazing. Pasture 1 was grazed continuously at the rate of one animal unit to two acres, pasture 2 was grazed continuously at the rate of one animal unit per acre, and pasture 3 stocked at the rate of one animal unit per acre was divided into two equal parts which were grazed alternately.

The plant population was affected by the rate and method of grazing, Canada bluegrass, timothy, orchard grass, and lespedeza predominating under light continuous grazing, while Kentucky bluegrass and white Dutch clover predominated under heavy continuous grazing. The harvested growth from protected areas indicated that over one-half of the total herbage was produced during the first one-third of the grazing season. Analysis of three samples showed a calcium: phosphorus ratio of approximately 2:1 and an average protein content for the season of 13.67 percent. The 6-yr. average gains per steer on pastures 1, 2, and 3 were 287, 196, and 194 lb., respectively, and the average gains per acre for the 6-yr. period were 145, 196, and 194 lb., respectively. Steers on the lightly grazed areas which gained 92 lb. more than those on the heavily stocked areas were considerably better finished at the close of the season. Surplus forage remaining on the ground of the lightly grazed area at the close of the regular season in 1933 and 1934 produced an additional gain of 43 lb. per acre when grazed by thin feeder cattle in late fall and early winter.

The role of the connective tissue in the pH determination of meat [trans. title], H. KELLER (*Ztschr. Fleisch. u. Milchhyg., 47 (1936), No. 5, pp. 89, 90*).—Connective tissue of freshly slaughtered animals has an extraordinarily high pH value, generally ranging from pH 7 to 7.4. On this basis muscle high in connective tissue should not be employed for pH studies, since the values obtained will be greater than actually exist in muscle low in connective tissue. Muscle tissue found satisfactory for such studies includes the rectus abdominis, gracilis, and pectoralis muscles. Excessive connective tissue tends to increase the pH value of the surrounding blood and fat, and on this basis sausage high in connective tissue is relatively unstable. The fact that putrefaction is first observed in the connective tissue elements of the carcass is attributed to their high pH value.

Sheep, L. J. HORLACHER and C. HAMMONDS (*Lexington, Ky.: Commercial Ptg. Co., [1936], pp. XII+305, figs. 150*).—This book presents approved methods in sheep production and management, and while primarily intended for the student in vocational agriculture it should serve as a convenient manual for those already engaged in sheep production. Successive chapters discuss: Planning for the sheep enterprise, choosing the breed, selecting and judging, feeding and managing the flock from breeding to lambing, feeding and caring for the ewes and lambs, fattening commercial lambs, preventing and controlling common parasites and diseases in sheep and lambs, producing and handling wool, marketing lambs and sheep, and fitting and showing sheep.

The golden hoof: A practical sheep book [edited by P. V. EWING] (*Chicago: Sheep Breeder, Inc., [1936], pp. 256, figs. 47*).—This volume is presented as a source of practical sheep information and represents contributions of 25 contemporary sheepmen, each a specialist in the subject treated.

Maintenance metabolism of growing swine [trans. title], K. BREIREM (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 5, pp. 463–498, figs. 2; Eng. abs., p. 496*).—Based on a series of fasting experiments with swine in an attempt to obtain a reliable function for the calculation of the maintenance requirement, the following equations were found to express the relationship between maintenance metabolism and body weight:

$$E=154.74W^{0.569} \text{ or } E=2131\left(\frac{W}{100}\right)^{0.569}$$

or in case a proper fraction is preferred

$$E=164.27W^{5/9} \text{ or } E=2126\left(\frac{W}{100}\right)^{5/9},$$

in which E is the maintenance metabolism for 24 hr., expressed as net energy requirement for maintenance, and W is the body weight. These results serve to confirm previous findings by the author (E. S. R., 76, p. 86). Of particular significance from the standpoint of experimental methods is the fact that a preliminary fast of from 8 to 10 days was required to arrive at true maintenance metabolism in 40- to 50-kg pigs.

Comparative studies of fattening in different types of pigs and with different rations [trans. title], C. KRONACHER, J. KLIESCH, and R. HUNDSDÖRFER (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 35 (1936), No. 2, pp. 191–212*).—This report is a summary of a large number of experiments in which both cross-bred and purebred pigs were fattened under three different systems of feeding. Under the first system pigs received potatoes ad libitum plus a daily allowance of 1 kg of medium protein meal per head throughout the fattening period. Under the second system the pigs were fed green alfalfa and a limited allowance of concentrate up to 70 kg live weight, after which they were fed according to the first plan. In the third system the pigs received potatoes ad libitum and a daily allowance of 2.5 kg of silage or other green feed and 0.5 kg of protein-rich concentrate. The latter system proved most economical, requiring less feed per unit of gain although requiring a slightly longer feeding period, while the second system proved the least desirable of the three. No significant differences were noted between the response of the cross-bred and purebred groups.

[Feeding trials with wood sugar yeast in the ration of swine] (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 6, pp. 594–607; Eng. abs., pp. 596, 599, 607*).—In fattening trials with pigs, reported from Tschechnitz by K. Richter and H. Brüggemann and from Kiel by H. Bünger, J. Schultz, and H. Augustin (with a general summary by Bünger) and in which the check ration contained beets, potatoes, and fish meal, substituting wood sugar yeast

(*xylose yeast*) *for one-half* the fish meal did not adversely affect appetites, rates of gain in weight, or feed utilization, but substitution of the yeast for all the fish meal resulted in failure. The yeast contained from 41 to 43 percent of digestible protein and had a starch value of 67 kg.

Temperature measurements on the working horse [trans. title], H. TOEPSCH (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 6, pp. 608–612; Eng. abs., p. 612*).—Temperature determinations made on the skin surface at different points on the bodies of horses showed a range of as much as 16° C. at diverse points, with highest temperatures occurring on the neck and the lowest on the back. Air temperature and rate of work greatly affected external body temperature, while the relative humidity of the atmosphere had little effect. Under like conditions, temperature measurements on the same part of the bodies of different horses showed little variation.

On the digestion of the cell wall constituents of feeds (lignin, pentosans, cellulose, and crude fiber) by the domestic hen [trans. title], A. TSCHERNIAK (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 5, pp. 408–462, fig. 1; Eng. abs., p. 451*).—Results of digestion trials with hens indicate that the cellulose, lignin, and pentosans of alfalfa meal are practically indigestible. In ground grains (wheat, corn, barley, or oats) and in ground soybeans the cellulose is likewise nearly indigestible, but lignins and pentosans are evidently digestible up to from one-eighth to two-fifths of their total content.

Comparative digestibility of ground and whole grain [trans. title], I. T. MASLIEFF and I. P. DENISSOFF (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 6, pp. 613–620; Eng. abs., p. 620*).—Results obtained in a series of trials with fowls indicate that in general grinding grain did not materially increase its digestibility. The digestibility of the fat in the ground grain averaged about 4.5 percent higher than in whole grain, but this is considered insignificant. A ground mash ration was digested more rapidly than whole grains as determined by rate of passage through the digestive tract, consequently mash feeding would permit a relatively larger feed consumption within a given time.

The feeding of pelleted feed [trans. title], R. FANGAUF and A. HAENFEL (*Arch. Geflügelk., 10 (1936), No. 10, pp. 353–358; Eng. abs., p. 358*).—Hens fed grain and pellets showed a decided preference for the grain. The time required for hens to become accustomed to pellets depended on the extent to which other feed was limited and also on the shape of the pellets, since it is shown that hens distinguish between different shaped pellets or nuts. The feeding of pellets had no advantage in any respect over grain feeding and was considered a complete failure from an economic standpoint.

Soybean oil meal prepared at different temperatures as a feed for poultry, J. W. HAYWARD, J. G. HALPIN, C. E. HOLMES, G. BOHSTEDT, and E. B. HART (*Poultry Sci., 16 (1937), No. 1, pp. 3–14*).—In a series of chick feeding trials at the Wisconsin Experiment Station, the use of high temperature expeller soybean oil meal (from 140° to 150° C. for 2½ min.), medium or high temperature hydraulic soybean oil meal (from 105° to 121° for 90 min.), or solvent extracted soybean oil meal (98° for 15 min.) as the primary source of protein in the chick ration resulted in chicks weighing almost twice as much at 8 weeks of age as those receiving the ground raw soybeans or low temperature expeller soybean oil meal (105° for 2 min.), while low temperature hydraulic meal (82° for 90 min.) gave intermediate results.

In trials involving various combinations of high temperature expeller meal, meat scrap, and dried milk in the ration of growing chicks and laying pullets,

rations containing 16 parts of soybean oil meal as the only protein concentrate proved inadequate, but a combination of 12 parts of soybean oil meal, 2 parts of meat scrap, and 2 parts of dried milk almost equaled an 8:4:4 or an all-animal protein 0:8:8 mixture with reference to growth of pullets at 20 weeks of age, and egg production of pullets over an 11-mo. laying period.

A study of the biological value of fish meals as determined by the raw material [trans. title], A. F. Arsenjew and N. J. Chlebnikow (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 6, pp. 580–593; Eng. abs., pp. 592, 593*).—It is shown that each of seven fish meals tested ranked higher than either casein or meat meal in growth-promoting value for chicks. All of the fish meals had a uniformly high coefficient of digestibility, ranging around 80 percent, and were adjudged as practically equal with regard to the biological value of the protein. However, they showed marked variation in vitamin B_2 content, certain ones failing to meet the requirements of growing chicks. Meals from the various sources are ranked on the basis of their growth-promoting value. The use of fish meal as the only source of animal protein in the chick ration is recommended. Fibrin, which has a very low biological value, may be combined with fish meal to give a product equal to casein in nutritive value.

A study of the effect of charcoal on chickens, also on the digestive function and feed utilization of fowls [trans. title], E. Mangold and H. Damköhler (*Arch. Geflügelk., 10 (1936), No. 8–9, pp. 289–316, fig. 1; Eng. abs., p. 315*).—The feeding of from 5 to 10 g of charcoal per hen daily checked or prevented diarrhea caused by feeding cane sugar in the mash or boiled potatoes as a sole diet. The voluntary intake of charcoal averaged 1.8 g per hen daily, or about 1.5 percent of the total ration. The addition of from 5 to 20 percent of charcoal in the ration of chicks or mature hens had no other noticeable effect, but in fattening cockerels its presence greatly accelerated the rate of growth. The presence of charcoal did not affect the digestibility of protein but slightly increased that of carbohydrates, particularly crude fiber.

The effect of feeding grit on digestibility in the domestic fowl, J. C. Fritz (*Poultry Sci., 16 (1937), No. 1, pp. 75–79*).—In studies by the U. S. D. A. Bureau of Animal Industry, two mature male birds were surgically altered to permit separate collection of urine and feces. These birds, which were reared on screen floors and without access to grit, were employed in a series of digestion trials to determine the effect of feeding grit on the digestibility of an all-mash ration and of southern field peas, each ration being tested with no grit, with from 3 to 6 g daily of fine granite grit, and with from 3 to 6 g daily of coarse granite grit. There was only a slight improvement in the digestibility of all constituents when grit was fed, and no significant differences were apparent from feeding the two sizes. The peas were shown to have a sufficiently high digestibility to justify their use in a poultry ration.

The vitamin A requirements of chicks with observations on the comparative efficiency of carotene and vitamin A, P. R. Record, R. M. Bethke, and O. H. M. Wilder (*Poultry Sci., 16 (1937), No. 1, pp. 25–33*).—In a series of feeding trials at the Ohio Experiment Station both prophylactic and curative types of feeding were employed to establish the minimum vitamin A requirements of growing chicks. Cod-liver oil, crystalline carotene, and alfalfa meal were used as sources of vitamin A, with the oil content of all rations kept constant by suitable additions of cottonseed oil. In the prophylactic trials the minimum requirement to promote normal growth and prevent symptoms of vitamin A deficiency to 8 weeks of age was established at from 50 to 100 μg (micrograms) of carotene, or from 80 to 160 international units of Vitamin A

per 100 g of ration. In the curative trials it appeared that about 100 μg of carotene, or from 120 to 200 units of vitamin A every other day, were required to cure and prevent symptoms of vitamin A deficiency in depleted chicks to 10 or 12 weeks of age. Carotene was effectively utilized by the chicks as a source of vitamin A, the response being similar to that obtained when equivalent rat units of the vitamin were supplied. The vitamin A requirement increased with age, and it is suggested that the minimum requirements as determined in this experiment may not be the optimum level under practical feeding conditions.

The vitamin A requirements of White Leghorn pullets during the growing period, G. E. Bearse and M. W. Miller (*Poultry Sci., 16 (1937), No. 1, pp. 34–38*).—Chick feeding trials at the Western Washington Experiment Station in which varying levels of dehydrated alfalfa meal were fed as a source of vitamin A to 24 weeks of age showed that 175 Sherman-Munsell units of vitamin A per 100 g of ration met the requirements of growing White Leghorn pullets.

The effect of varying levels of vitamin A in the hen ration on the vitamin A content of the egg yolk, on hatchability, and on chick livability, G. E. Bearse and M. W. Miller (*Poultry Sci., 16 (1937), No. 1, pp. 39–43, fig. 1*).—In these trials all groups of pullets reared on rations as described above were continued through their first laying period on rations containing the same levels of dehydrated alfalfa as employed during the growth period.

The vitamin A content in their egg yolk varied in proportion to the amount of vitamin A supplied in the ration, and the chicks hatched from the eggs lived and grew on vitamin A-deficient rations in proportion to the amount of vitamin A in the ration of the parent stock. Maximum hatchability was attained when 500 Sherman-Munsell units of vitamin A per 100 g of ration were fed.

The effects of storage on the vitamin D value of Columbia River salmon fish meal, J. S. Carver, V. Heiman, and J. L. St. John (*Poultry Sci., 16 (1937), No. 1, pp. 68–74, fig. 1*).—In chick feeding trials at the Washington Experiment Station salmon fish meal (17.4 percent fat) fed at either 2.9-percent or 5.7-percent levels in the all-mash ration gave complete protection against rickets. The same mixed ration after one year's storage still afforded protection at the same levels of feeding, but when the fish meal was stored separately for 1 yr. and then incorporated in the mix it gave protection at the 5.7-percent level but failed at the 2.9 level. It is suggested that the basal ration may have acted as an antioxidant in preventing loss of vitamin D in the salmon meal during storage.

Differentiation between vitamin G and an insoluble factor preventing a pellagra-like syndrome in chicks, A. T. Ringrose and L. C. Norris (*Jour. Nutr., 12 (1936), No. 6, pp. 535–552, pl. 1, fig. 1*).—This is a continuation of previous investigations (E. S. R., 66, p. 862), in which it has been found that egg white is greatly deficient in a pellagra-preventing factor but contains a fairly large amount of a growth-promoting factor for chicks, whereas purified casein is nearly adequate in a pellagra-preventing factor but very deficient in a growth-promoting factor.

In this experiment rations containing either commercial dried egg white or purified casein were fed to groups of chicks unsupplemented and supplemented with either dried liver, a water-alcohol liver extract, the extracted liver residue, heated dried liver, or liver autoclaved at pH 11. The results of these trials indicate that dried pork liver contains a factor necessary to prevent the pellagra-like syndrome in chicks on the egg white diet and also a factor necessary to promote growth on the purified casein diet. The antipellagra factor was insoluble in alcohol-water mixture and was destroyed by heating in a dry atmos-

phere and by autoclaving at pH 11, although not at pH 9. On the other hand, the growth-promoting factor was soluble in alcohol-water mixture, was stable to heating in dry atmosphere, and relatively stable to autoclaving at pH 11. This factor is designated as vitamin G. The evidence indicates that the syndrome developing on the egg white diet is identical with that developing to a lesser degree on the purified casein diet. Autoclaving dried egg white for 6 hr. at 15 lb. pressure at the natural pH (5.9 to 6) or at pH 9 overcame the tendency to produce this syndrome, probably due to the formation or release of the preventing factor during autoclaving.

Differentiation between vitamin G and a soluble factor preventing a pellagra-like syndrome in chicks, A. T. Ringrose and L. C. Norris (*Jour. Nutr., 12 (1936), No. 6, pp. 553–569*).—In further investigations it is shown that heating the purified casein diet (above) at from 95° to 100° C. for 144 hr. destroyed the pellagra-preventing potency of the ration. Supplementing this heated ration with dried pork liver prevented the pellagra-like syndrome and also promoted growth in chicks. It is shown that both the pellagra-preventing and growth-promoting factors present in the liver are soluble in alcohol-water mixture and are sensitive to, but are not destroyed by, autoclaving at pH 11. The pellagra-preventing factor was destroyed by heating in a dry atmosphere and was not adsorbed from the liver extract on fuller's earth, whereas the growth-promoting factor was relatively stable to dry heat and was adsorbed on fuller's earth. Thus vitamin G as defined above is a complex, containing both of these soluble factors. Further evidence indicates the identity of the pellagra-like syndrome which develops on the heated casein diet and on a raw egg white diet, and apparently both the alcohol-water soluble factor and the alcohol-water insoluble factor are required to prevent its development.

The "per cent firsts" as a measurement of egg size in pullet yields, W. C. Thompson (*New Jersey Stas. Bul. 621 (1936), pp. 20, figs. 12*).—The author studied the relationship between the percentage of first-grade eggs produced during certain seasons of the year and "per cent firsts" for the entire year from approximately 1,500 Single Comb White Leghorn pullets entered in the New Jersey egg-laying contests. The record year has been divided into three parts, namely, the winter season from October 1 to January 31, the spring season from February 1 to May 31, and the summer-fall season from June 1 to September 21. Frequency distribution tables, the degree of correlation for winter-year, spring-year, summer-fall-year, winter-summer-fall, and January-year "per cent firsts", and regression equations for predicting the yearly performance from any of the above-described short-time records are presented. In each instance the "per cent firsts" shown for a particular season was found to be positively and highly significantly correlated with the "per cent firsts" produced throughout the first laying year, with an indication that a prediction of the "per cent firsts" for the year based on "per cent firsts" in winter, in January, in spring, and in summer-fall would be 36, 45.4, 61, and 55.8 percent better than pure guess. It appears that the weighing of eggs for at least a 30-day period at any time after the layers have passed the third month of production may be used as a reasonable measure of the individual bird's egg-size quality character.

Augmentation of nitrogen to the egg white after the formation of the shell membranes in the fowl, H. M. Scott, J. S. Hughes, and D. C. Warren (*Poultry Sci., 16 (1937), No. 1, pp. 53–61*).—In a study at the Kansas Experiment Station the absolute nitrogen content of laid eggs (each representing the first of a clutch) from 13 hens was compared with that in immature eggs from the same individuals (each representing the second egg of the same clutch intercepted in the isthmus). It was found that the immature eggs contained an

average of 96 percent as much nitrogen as the laid eggs, although the former contained only 51 percent by weight as much white as the latter.

By determining the total nitrogen in the consecutively laid eggs from 8 hens it was shown that the second-laid egg of a clutch averaged only 90 percent as much nitrogen as the first egg of the same clutch. It is concluded that differences in the nitrogen content of immature and laid eggs as noted by Pearl and Curtis (E. S. R., 26, p. 670) were due entirely to the effect of clutch position and not to any infiltration of protein through the shell membrane. It is pointed out that according to the laws of physical chemistry protein would not pass from the uterine secretion of low protein concentration through the shell membrane into the egg white of higher protein concentration.

Loss of weight of hen's eggs during incubation under different conditions of humidity and temperature, E. M. Pringle and H. G. Barott (*Poultry Sci., 16 (1937), No. 1, pp. 49–52, fig. 1*).—In tests conducted by the U. S. D. A. Bureau of Animal Industry, in which eggs were incubated in respiration calorimeters under carefully controlled conditions, loss of weight of fertile eggs during incubation was found to depend principally upon the relative humidity of the surrounding atmosphere. Rate of loss decreased in direct proportion to the increase in humidity within the tested range of from 8 to 85 percent at a constant temperature of 102° F.

When incubation temperatures were varied from 96° to 102.5° at a constant relative humidity of 60 percent a range of 96° to 99° had but slight effect on loss of egg weight, but at temperatures from 99° to 103.5° the weight loss became progressively greater with each degree rise in temperature, the total loss at the latter temperature averaging one-third greater than at the former. The daily loss of weight increased as incubation proceeded. A slight inverse relation was found between weight of eggs and loss of weight.

Blood chemistry of the chick embryo during ontogenesis, C. M. Zorn and A. J. Dalton (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 3, pp. 451–453*).—Values for blood sugar, uric acid, cholesterol, hemoglobin, and red blood cells in the blood of chick embryos by one-day intervals from the ninth to the twentieth day of incubation and from the first to the fourth day of postincubation are presented in tabular form and briefly discussed.

Electric brooding, J. C. Taylor and W. C. Krueger (*New Jersey Stas. Hints to Poultrymen, 24 (1936–37), No. 2, pp. 4, fig. 1*).—Certain practices which should be observed in the operation of an electric chick brooder are outlined.

DAIRY FARMING—DAIRYING

[Dairy cattle and dairy products investigations in Iowa] (*Iowa Sta. Rpt. 1936, pt. 1, pp. 70–72, 73, 74, 86–88, 116–126*).—Breeding and feeding studies reported include the consequences of inbreeding in Holstein-Friesian cattle, by J. L. Lush, C. Y. Cannon, and E. N. Hansen; the persistency and inheritance of milk and fat production among cows in Iowa cow-testing association herds, by Lush and E. N. Schultz; the relation of vitamin E to sterility (in goats), by Cannon, D. L. Espe, B. H. Thomas, and S. H. McNutt; the value of soybean gruel for calves, by Cannon, Espe, and Thomas; a comparison of roughages and the relation of roughage to grain in dairy cow rations, by Cannon, Hansen, and Espe; and storing hay with a modified silage cutter and a hay fork, by Cannon, Espe, Hansen, and E. V. Collins.

Studies with dairy products yielded results on the influence of the acidity in cream on fat losses in buttermilk, the kinds of acids in butter and the distribution of these acids between the water and fat phases, the effect of

neutralizers on fat losses in buttermilk and the quality of the butter, and the causes of tallowy flavor and other defects in strawberry ice cream, all by E. W. Bird; *Pseudomonas fragi* as a cause of rancidity in butter, microorganisms causing surface taint in butter, the germicidal property of milk for *Streptococcus lactis*, the importance of acetylmethylcarbinol and diacetyl in butter cultures, the development of butter cultures from mixtures of organisms and with reference to mail shipment, and the classification of the organisms important in dairy products, all by B. W. Hammer; the nitrogen metabolism of *Lactobacillus casei* cultures important in Cheddar cheese made from pasteurized milk, and the protein and fat metabolism of various strains of *Penicillium roqueforti* used in Iowa blue cheese, both by C. B. Lane and Hammer; the production of 2,3-butylene glycol in dairy products, by Hammer and C. H. Werkman; the manufacture and introduction of a special-type Swiss cheese, by E. F. Goss and M. Mortensen; and a comparison of sediment tests for cream and butter, by L. A. Harriman and Bird.

[Dairy cattle investigations at the North Louisiana Substation] (*Louisiana Sta., North Louisiana Sta. Bien. Rpt. 1935–36, pp. 21–23*).—Brief results are noted on the profitability of dairying and feed production as supplements to cotton farming, the value of different cereals and vetch for winter grazing and of Sudan grass, kudzu, soybeans, and sweetpotato vines as summer grazing crops, feeding trials with chopped sweetpotatoes, dried sweetpotato pulp, and other feeds, and the effect of certain fertility treatments on permanent pasture results, all by S. Stewart and R. H. Lush.

[Dairy investigations in New Mexico] (*New Mexico Sta. Rpt. 1936, pp. 50, 51, 52*).—Projects previously noted (E. S. R., 75, p. 98) have been continued, with progress reported on the physiological effect of a hegari fodder and cottonseed meal ration on dairy cows and the vitamin A content of the butterfat produced.

Dairy cattle judging, A. B. Nystrom (*U. S. Dept. Agr., Farmers' Bul. 1769 (1937), pp. II+30, figs. 21*).—This supersedes Miscellaneous Circular 99 (E. S. R., 57, p. 371).

Effect of breed, size of cow, yield of milk, and stage of lactation upon efficiency of milk production, J. Edwards (*Jour. Dairy Res. [London], 7 (1936), No. 3, pp. 211–221, fig. 1*).—Based on an analysis of 2,400 2-day production records of cows, representing 12 dairy breeds as entered at the London Dairy Shows between 1922 and 1934, it is shown that among the best representatives of the various breeds there is little difference in the gross efficiency of milk production (the ratio of energy in the milk to the energy in the digestible nutrients consumed). Within a breed there is a tendency for gross efficiency to decrease with increase in live weight. Cows are more efficient than heifers. Cows milked three times daily are more efficient than those milked twice daily, and a steady decline in efficiency with advance of lactation was noted.

A comparison between blood meal and wheat gluten as a supplement to a low protein diet for dairy cows, S. Bartlett (*Jour. Dairy Res. [London], 7 (1936), No. 3, pp. 222–227*).—Two groups of five milking cows each were employed in a double reversal feeding trial to compare blood meal (a lysine-rich protein) and wheat gluten (a lysine-poor protein) as supplements to a basal ration relatively low in protein and lysine content. These supplements were fed at approximately 2-percent levels in the concentrate ration, so that the low lysine group received from 9.9 to 10.8 g of lysine per gallon of milk produced while the high lysine group received approximately 20 percent more. Little difference was noted in the milk production obtained from the two rations, the slight advantage of the blood meal ration over the wheat

gluten ration failing to approach statistical significance. There was a small and almost significant advantage in live weight gains in favor of the former ration.

An experiment on substitution of ammonium bicarbonate for foreign oil cake protein in feeding milk cows on beet silage [trans. title], P. Ehrenberg and v. Prittwitz (*Landw. Vers. Sta., 125 (1936), No. 1–2, pp. 101–118*).—In a trial with two groups of milking cows, each receiving approximately the same total dry matter and starch equivalent in their rations, one group was given a supplement of 100 g of ammonium bicarbonate per head daily while the other received 0.5 kg of a mixture of soybean, peanut, and cottonseed cakes. The former group produced about 15 percent less milk than the latter group. A slightly higher percentage of butterfat in the milk of the group receiving the ammonium bicarbonate was the only significant difference noted in the composition of the milk from the two groups.

Utilization of vitamin A by dairy cows, G. S. Fraps, O. C. Copeland, R. Treichler, and A. R. Kemmerer (*Texas Sta. Bul. 536 (1937), pp. 26*).—In the first of the experiments reported 3 groups of 3 Jersey cows were fed rations containing such quantities of yellow corn and alfalfa meal as to provide 7,000, 170,000, and 340,000 Sherman-Munsell units of vitamin A per cow daily for the respective groups. Butter samples were collected at intervals over a 17-week period, and the vitamin A potency of the butter and of the feeds was determined in Sherman-Munsell units by rat assay.

At the beginning of the trial butter samples contained from 43 to 62 units of vitamin A and from 9.7 to 16.7 p. p. m. of carotene, while at the end of 17 weeks these values had decreased to 4, 12, and 10 units of vitamin A and 0.4, 3.9, and 3.6 p. p. m. of carotene for the 3 groups, respectively. The apparent percentage recovery was greatest at the beginning of the trial and for the cows receiving the least amount of vitamin A in the feed, which was due to the use of large proportions of the carotene and vitamin A stored in the body of individuals by the cows receiving the low carotene intake.

Correcting for the vitamin A potency stored by the cows by methods as outlined, the utilization was from 2.38 to 2.67 percent for an average of the periods. The carotene and spectro-vitamin A content of the individual butter samples indicated that some cows have a greater power than others to secrete vitamin A and carotene into the butter. A. I. V. sorghum silage was low in carotene and had little effect upon the carotene and vitamin A in the butter when fed to cows previously depleted. When 2 cows previously depleted were placed upon pasture the vitamin A potency of the butter increased from 12 units per gram to 40 or 50 units per gram within 3 days. The potency of the butter from cows on pasture was high, reaching a maximum of 72 units with one cow and 101 units for the other. The vitamin A potency of butter is closely related to the vitamin A potency of the feed and the period the cow has been receiving it. It is estimated that from 750,000 to 1,400,000 Sherman-Munsell units are required per cow per day to produce butterfact containing from 65 to 95 units per gram.

A note on feeding vitamin A and D concentrate in cod-liver oil to calves, A. C. Dahlberg and L. A. Maynard (*Jour. Dairy Sci., 20 (1937), No. 1, pp. 59–61; abs. in Farm Res. [New York State Sta.], 3 (1937), No. 3, pp. 1, 8*).—In a trial at the New York State Experiment Station over a 40-week growth period, there was no apparent advantage of adding vitamin A and D cod-liver oil concentrate to a dairy calf ration consisting of 2.5-percent milk, skim milk, grain, and liberal amounts of alfalfa hay. The fact that the experimen-

tal calves without vitamin supplement were more thrifty than the general run of calves raised in the station herd is attributed to the greater consumption of alfalfa hay by the former group.

Raising the dairy calf, H. A. Herman (*Missouri Sta. Bul. 377 (1937), pp. 28, figs. 11*).—This is a popular bulletin on calf raising, successive sections dealing with care of the newborn calf, methods of raising the dairy calf, including feeding plans where skim milk is available and where milk substitutes must be used, suggestions on general management of calves, and the feeding and management of young dairy stock.

The composition of the colostrum of the dairy goat, A. J. Bergman and C. W. Turner (*Jour. Dairy Sci., 20 (1937), No. 1, pp. 37–45, figs. 2*).—This contribution from the Missouri Experiment Station reports the composition of colostrum and the trend of the various constituents in the transition to normal milk of 6 goats. Daily samples were analyzed over 9-day periods, and the analytical procedures are described. All of the constitutents showed a rapid decrease in percentage during the second day except lactose, which increased. The colostrum closely approached normality between the third and fourth days. Globulin and albumin were determined separately in this study, and a very rapid decrease in the globulin is noted following removal of the first milk from the udder, while only a moderate decline occurred in the albumin.

Measuring the thickness of thin, flowing, liquid films, H. H. Beck and K. G. Weckel (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 4, pp. 258, 259, figs. 3*).—This describes a new method for determining the thickness of flowing liquid films. The method utilizes the principle that some light is reflected from any surface and that the angles of incidence and reflection are equal. When a beam of light is projected on the surface of the film at an angle of 45° the distance between the parallel beams reflected from the surface of the film and from the metal surface supporting the film may be used as a basis for calculating the thickness of the film. The method, developed primarily to determine the thickness of milk films subjected to ultraviolet irradiation, has been found sufficiently sensitive to determine variations in the thickness of the film, such as those caused by changes in velocity, within successive short intervals.

Film characteristics: Effect on response of fluid milk to ultraviolet radiation, H. H. Beck and K. G. Weckel (*Indus. and Engin. Chem., 28 (1936), No. 11, pp. 1251–1254, figs. 7*).—Employing a light beam reflecting method as described above, the authors have determined the thickness, velocity of flow, and travel time of controlled thin flowing films of milk passing over a metal surface. Empirical formulas are presented for expressing these values as power functions of the film capacity (pounds per foot per hour). The character of the finish of the metal affects the thickness and other characteristics of the flowing film, and the degree of inclination of the surface also affects the film thickness. In a study of the relation between the thickness, velocity, and travel time of the film to the antirachitic potency acquired by the milk from ultraviolet radiation, it is shown that viamin D potency is directly proportional to the travel time, thus emphasizing the importance of time in the irradiation of milk.

Milk: Effect of different sources of radiant energy on flavor and antirachitic potency, K. G. Weckel, H. C. Jackson, R. Haman, and H. Steenbock (*Indus. and Engin. Chem., 28 (1936), No. 6, pp. 653–656, figs. 3*).—These experiments, conducted at the Wisconsin Experiment Station, represent an attempt to determine what part of the spectrum of various available sources

in irradiated milk. Three sources of radiant energy were employed, namely, the carbon arc (including five types of carbon electrodes), the quartz mercury-vapor arc, and the cold-quartz arc. Identical milk samples were irradiated until a uniform intensity of flavor was produced when the energy from each source was transmitted through quartz and through glass. There was a marked variation in the time required and the total energy expended from the different sources of irradiation to produce a uniform flavor change, and a like variation in the degree of antirachitic potency acquired by the milk was noted. It is shown that the flavor changes are caused by that part of the spectrum known to have an antirachitic effect as well as to parts of the spectrum devoid of such properties. The data indicate that within a spectral range below 3,100 a. u. the energy in wave lengths less than 2,600 a. u. is more active in flavor production than wave lengths between 2,600 and 3,100. Similarly, in a spectral region from 3,100 to 7,000, radiations of from 3,100 to 3,800 are more active in this respect than those from 3,800 to 7,000 a. u.

The rate of change in the vitamin A content of milk, W. C. Loy, J. H. Hilton, J. W. Wilbur, and S. M. Hauge (*Jour. Dairy Sci., 20 (1937), No. 1, pp. 31–36, fig. 1*).—The object of this experiment at the Indiana Experiment Station was to determine the time required for the carotene and vitamin A content of milk to reach an equilibrium level when cows were changed from a high vitamin A ration to one of low vitamin A value and vice versa. Two Guernsey cows were fed an alfalfa hay, corn silage, and grain ration (high vitamin A) for 30 days, then changed to a ration of timothy hay, corn silage, and grain (low vitamin A) for a 21-day period, and then back to the original ration for an additional 21-day period. Butter was churned from milk samples at frequent intervals, chemically analyzed for carotene, and biologically assayed for vitamin A. During the depletion period the carotene and vitamin A in the milk fat declined rapidly, reaching an equilibrium level in about 11 days. During the repletion period the rise in these ingredients was rapid, reaching a constant level in 10 days. It is concluded that the major effect of a change in the diet on the vitamin A content of cows' milk can be ascertained by relatively short feeding trials.

Variations in the vitamin C content of milk, C. H. Whitnah and W. H. Riddell (*Jour. Dairy Sci., 20 (1937), No. 1, pp. 9–14*).—In further tests at the Kansas Experiment Station of factors causing variations in the vitamin C content of milk (E. S. R., 75, p. 245), the ascorbic acid content of the milk of from 40 to 58 individual cows in the station herd has been determined on three consecutive days of each month from October through April, with most of the animals receiving a typical winter ration without access to pasture.

Significant variations were noted between morning and evening milk samples and also from day to day, indicating that the vitamin C content of milk for a given cow or herd cannot be adequately determined by a single test. The level of production, age of the animals, and access to green feed are each shown to have only a slight effect, while season of the year, the individuality and breed of the cow, and the stage of lactation appear to be the most important factors causing variation in the vitamin C content of fresh milk from well fed cows.

A study of the seasonal variation of vitamin D in normal cow's milk, H. E. Bechtel and C. A. Hoppert (*Jour. Nutr., 11 (1936), No. 6, pp. 537–549, figs. 3*).—Samples of milk from Holstein and Guernsey herds were assayed monthly for a period of 2 yr., and assays were made on butter samples during a 1-yr. period. The herds were kept under parallel conditions regarding sunshine and the ingestion of sun-cured feeds. A method is given for the

concentration of the antirachitic factors in milk fat so that fats of low potency can be biologically assayed.

The results obtained demonstrate that the antirachitic potency of milk may vary as much as 900 percent over a 2-yr. period, reaching a maximum from June to September, and, beginning with October, declining rapidly to a minimum in February. The vitamin D values ranged from 4.8 to 43.8 U. S. P. units per quart of Guernsey milk and from 3.1 to 27.7 U. S. P. units per quart of Holstein milk.

The amount of exposure of the cows to sunlight would appear to be the most important contributing factor as to the variability of the vitamin D content of milk. The vitamin D contained in dairy feeds apparently contributed very little to the potency of the milk. The cow has little or no opportunity to store vitamin D during lactation under ordinary dairy management conditions. The results of the bio-assays on the butter samples indicate that vitamin D in milk fat is stable for at least 30 mo. when stored at 0° F. in the dark.

Factors affecting the activatability of milk with ultra-violet light, W. E. Krauss, R. M. Bethke, and R. G. Washburn (*Jour. Dairy Sci., 19 (1936), No. 12, pp. 739–747*).—The Ohio Experiment Station has studied the effect of varying butterfat contents, various feeding conditions, including winter feeding v. pasture feeding, high protein rations v. low protein rations, and A. I. V. silage v. alfalfa hay, and breed on the degree of vitamin D enrichment attainable in milk through ultraviolet light irradiation. All samples were assayed by the standard line test procedure with rats.

In general, as the butterfat content of mixed herd milk increased (range from 0.025 to 6.3 percent), the capacity for vitamin D enrichment increased. The activatability of milk produced under various feeding practices, when standardized to a uniform butterfat content and irradiated under comparable conditions, is determined primarily by the original vitamin D potency of the unirradiated samples. Samples of Holstein and Jersey milks, either standardized to the same fat content or unstandardized, were activated to about the same degree of potency, suggesting that the solids-not-fat of Holstein milk may contain more activatable material than that of Jersey milk.

Amylase in cow's milk, G. A. Richardson and C. L. Hankinson (*Jour. Dairy Sci., 19 (1936), No. 12, pp. 761–772*).—This study at the California Experiment Station produced evidence that normal cow's milk possesses starch liquefying, starch dextrinizing, and starch saccharifying activity. Based on the assumption that α-amylase accelerates starch dextrinization while β-amylase induces saccharification, milk apparently carries both α- and β-amylase. While considerable variation is noted between the activity of milk from different individuals, in general milk having high saccharifying activity also has high dextrinizing power. Milk from mastitis-infected udders shows greater diastatic activity than normal milk. The α fraction is partially inactivated by heating to 55° C. for 30 min., whereas the β fraction is completely stable when heated at 65° for 30 min. In testing for potency of these fractions an incubation temperature of from 30° to 40° or the former and 50° for the latter is considered optimum.

Variations in the phosphomonoesterase content of the milk of the cow in relation to the progress of lactation, S. J. Folley and H. D. Kay (*Enzymologia, 1 (1936), No. 1, pp. 48–54, figs. 9*).—This report is based on the determination of the concentration of phosphatase in 540 milk samples from Dairy Shorthorn cows and 104 samples from Guernsey cows, the samples

representing all stages of lactation for each breed. The output of phosphatase varied regularly throughout lactation, rising to a maximum at about 180 days post partum. The typical milk phosphatase concentration-lactation period curve is shown to be qualitatively the inverse of the milk yield-lactation period curve. No such regular changes occur in the phosphatase content of the blood serum with advance of lactation, indicating that the milk enzyme does not come directly from the blood. There is further indication that the rate of secretion of phosphatase in milk is in general inversely related to the functional efficiency of the mammary gland.

The fate of acetylmethylcarbinol and diacetyl in dairy products, G. L. Stahly, B. W. Hammer, M. B. Michaelian, and C. H. Werkman (*Iowa Acad. Sci. Proc., 42 (1935), pp. 73–76*).—In a series of tests in which either tomato bouillon or skim milk containing citric acid was inoculated with cultures of citric acid fermenting streptococci, incubated at 21° C. for from 24 to 48 hr. and then received additions of either acetylmethylcarbinol or diacetyl, it was found that both these substances were rather rapidly reduced to 2,3-butylene glycol. Increasing the acidity of the medium, adding certain hydrogen acceptors as sodium fumarate or hydrogen peroxide, and reducing the holding temperature each tend to reduce the rate of reduction, whereas neutralizing the cultures and holding at 21° results in very rapid reduction.

The relation of the oxidation-reduction potential of milk to oxidized flavor, R. E. Webb and J. L. Hileman (*Jour. Dairy Sci., 20 (1937), No. 1, pp. 45–47, figs. 7*).—Employing an improved type of platinum electrode, the construction of which is described, the authors have made oxidation-reduction potential determinations on a large number of milk samples and ascertained the relation of these values to the degree of oxidized flavor developing in the milk.

In a series of milk samples from individual cows drawn and pasteurized in glass containers, the absolute value of the oxidation-reduction potential appeared to have no relation to the degree of oxidized flavor which developed.

Samples of winter mixed herd milk coming in contact with exposed copper in the processing equipment were highly susceptible to the development of oxidized flavors. This was due to or accompanied by an increase in the oxidation-reduction potential of the milk to a point sufficiently high to bring about a change in some milk constituent. Summer mixed herd milk processed in the same equipment showed approximately the same degree of increase in reduction potential as winter milk but resisted the development of oxidized flavors. The exact cause for the reduced susceptibility of summer milk was not determined by this study, but apparently is not due to bacterial action. Winter milk processed in new equipment free from exposed copper areas did not show a marked increase in oxidation-reduction potential and failed to develop oxidized flavor in most instances, leading to the conclusion that mixed herd milk will rarely develop oxidized flavors unless contaminated with copper or some other agent that will raise the oxidation-reduction potential. Measurements of oxidation-reduction potential are considered a delicate means of detecting the source of copper contamination in a milk plant.

The "transition point" of milk fat, G. A. Richardson (*Jour. Dairy Sci., 19 (1936), No. 12, pp. 749–752, fig. 1*).—This contribution from the California Experiment Station describes a technic employed in determining the transition point in milk fat, i. e., the temperature at which a second phase begins to separate from a molten fat. Nine typical cooling curves for different fat samples are presented, primarily illustrating the influence of various feeding

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practices on the transition point. Certain constants for these fat samples are given, from which it is evident that the cooling curve yields an insight into the physical and chemical nature of the fat.

Why do fat tests vary? A perpetual query, J. C. Marquardt and H. L. Durham (*Farm Res.* [*New York State Sta.*], *3* (*1937*), *No. 3, p. 15*).—Concluding this series (E. S. R., 76, p. 844), data are reported indicating that the cream adhering to the sides of the cans does not alter the composition of the sample taken from the milk weigh vat as compared with the fresh milk sample or one taken directly from well-stirred milk in the can before dumping. Neither did the storage temperature to which milk was subjected before sampling affect the test. It is concluded that from 20 to 200 comparisons are sufficient to establish the accuracy of the routine method of sampling for any given installation. It is desirable that each installation be checked to establish its correctness for proper sampling of milk for fat analysis, since such factors as shape of the weigh can, type of strainer, etc., vary from plant to plant.

Manual for milk and cream testers in Maryland, C. W. England (*Maryland Sta. Bul. 401* (*1936*), *pp. 113–164, figs. 15*).—This bulletin describes methods for determining the butterfat content and other miscellaneous tests on dairy products, presents general information for testers, and sets forth the specifications for Babcock glassware and the dairy inspection law of Maryland.

Begin studies on paper milk containers, R. S. Breed (*Farm Res.* [*New York State Sta.*], *3* (*1937*), *No. 3, pp. 7, 14*).—Certain problems relating to the use of single service paper milk containers, with particular reference to methods for preventing bacterial contamination, and desirable sanitary standards for such containers are discussed.

Cleaning dairy equipment with trisodium phosphate, L. A. Rogers and F. R. Evans (*Jour. Dairy Sci., 19* (*1936*), *No. 12, pp. 733–738*).—This report from the U. S. D. A. Bureau of Dairy Industry shows that dairy equipment, such as separator parts, milking machine parts, and homogenizers, may be satisfactorily cleaned and sterilized by rinsing the parts in clean water, keeping them submerged in a 5-percent solution of trisodium phosphate from one period of use to the next, and rinsing in clean water before reassembling. Data are presented to indicate that the addition of 3 percent of sodium chromate to the trisodium phosphate entirely prevented corrosive action of the solution on tin plate, while additions of from 1 to 20 percent of either sodium perborate or sodium metasilicate to the phosphate reduced but did not prevent corrosion.

A study of the churn cleaning methods used by plants producing butter of various yeast and mold counts, H. A. Bendixen (*Jour. Dairy Sci., 20* (*1937*), *No. 1, pp. 15–25*).—This report from the Washington Experiment Station presents the results of a survey of methods employed in cleaning the churns in 17 cooperating creameries in the State and the yeast and mold counts of butter samples submitted by the respective plants. Good churn-cleaning methods are shown to be definitely related to low yeast and mold counts in butter. When the plants were grouped according to the median yeast and mold counts of butter samples the average butter score both when fresh and after 1 month's storage at from 36° to 41° F. decreased, and the average score loss during storage increased as the median yeast and mold counts increased.

Factors relating to the keeping quality of butter, O. R. Overman (*Natl. Butter and Cheese Jour., 27* (*1936*), *No. 24, pp. 6, 7*).—The keeping quality of 36 different lots of stored butter, representing a wide range as regards the condition of cream from which the butter was churned, has been determined by the Illinois Experiment Station. It is concluded that neither the judges'

score of a butter sample, the chemical and physical constants of the butter, nor the rates of oxidation in butter are correlated with its keeping quality. On the basis of the initial score and ability to hold score, sweet cream butter is ranked first, followed by butter from starter ripened and partially neutralized cream, which in turn is superior to butter from spontaneously soured cream neutralized to the same acidity. Little difference was noted in the effect of different neutralizers used on initial score or keeping quality, while overneutralization resulted in low initial score and low keeping quality. In unneutralized cream butter, keeping quality declined with increased acidity. Salted sweet cream butter had a higher initial score but lost score more rapidly than unsalted sweet cream butter, samples of the latter being of salable quality after 2 yr. in storage.

Observations on yeasts causing gas in sweetened condensed milk, H. C. Olson and B. W. Hammer (*Iowa State Col. Jour. Sci., 10 (1935), No. 1, pp. 37–43, fig. 1*).—This report deals with the types of yeast isolated from eight samples of gassy sweetened condensed milk. All samples yielded an oval yeast identified as *Torula lactis-condensi*, the characteristics of which are extensively described. Two of the samples also yielded a spherical yeast which is described and for which the name *T. globosa* is suggested. Apparently the former organism or the two growing together are commonly the cause of gas formation in sweetened condensed milk. When the two species are growing together the former is invariably the more numerous. Certain factors which may cause failure to secure gas formation when these organisms are inoculated into normal sweetened condensed milk are discussed.

First hand observations on cheese making in Germany, J. C. Marquardt (*Farm Res. [New York State Sta.], 3 (1937), No. 3, pp. 10, 11, figs. 3*).—This article gives a brief résumé of the present status of the cheese industry in Germany, with a note on the trends in cheese research in that country.

The importance of the fat globule membrane in the freezing of ice cream, C. D. Dahle and D. V. Josephson (*Ice Cream Rev., 20 (1937), No. 6, pp. 60, 62, 64, 66, 68, 70, 71*).—In an investigation at the Pennsylvania Experiment Station to determine the reasons for the relatively poor whipping properties of ice cream mixes made from butter, butter oil, frozen cream, and plastic cream, it is shown that the whipping ability of such mixes is directly related to the degree to which the mixes "oil off" during processing. This condition is probably the result of foreign membranes being established on the surface of the newly formed fat globules during reemulsification. These membranes are a mixture of all the surface-tension-active substances in the mix, many of which are not conducive to good whipping. As a result of incorporating various emulsions of butter and butter oil into mixes, using a butterfat "membrane suspension", egg yolk, egg or milk phospholipids, skim milk, buttermilk, vegetable lecithin, and starch, respectively, as emulsifying agents, it is concluded that the presence of a protein-phospholipid complex or membrane, such as that supplied by the egg yolk or membrane suspension, on the surface of the fat globules in the mix is essential for normal whipping properties.

VETERINARY MEDICINE

[Contributions on animal pathology] (*N. Y. State Vet. Col. Rpt., 1934–35, pp. 46–154, pls. 12*).—Contributions relating to animal physiology, pathology, parasitology, etc., here presented (E. S. R., 74, p. 539) are as follows: The Correlation of Anatomy and Epidural Anaesthesia in Domestic Animals, by G. S. Hopkins (pp. 46–51); A Non-Alcoholic Bromthymol Blue Solution, by C. E.

Hayden and S. D. Johnson (p. 52); Chemical Examination of the Blood and Chemical and Morphological Examination of the Urine (pp. 53–62) and Calcium Metabolism and Therapy (pp. 63–74), both by C. E. Hayden; The Acid-Base Balance in Cows and Ewes During and After Pregnancy, With Special Reference to Milk Fever and Acetonemia, by J. Sampson and C. E. Hayden (pp. 75–82) (E. S. R., 72, p. 692); Recent Progress in the Physiology of Digestion, by H. H. Dukes (pp. 83–89); Urinary Calculi, by H. J. Milks (pp. 90–96); Urinary Antiseptics, by H. C. Stephenson (pp. 97–101); A Study of *Gastrophilus* spp. Infestations of Horses in New York State, by D. W. Baker (pp. 102–110); Bovine Trichomoniasis, by H. S. Cameron (pp. 111–119) (E. S. R., 73, p. 685); Bang's Disease of Cattle, by R. R. Birch and H. L. Gilman (pp. 120–137); Recovery From Johne's Disease: Report of a Case, by W. A. Hagan and A. Zeissig (pp. 138–141) (E. S. R., 73, p. 849); and Vaccination Against Johne's Disease (pp. 142–149) (E. S. R., 74, p. 696) and The Relationship of Certain Diseases of Cows to Disease in Man (pp. 150–154), both by W. A. Hagan.

Annual report of the veterinary service for the year 1935, R. J. Roe (*Cyprus Dept. Agr. Ann. Rpt., 1935, pp. 37–48*).—The work of the year is briefly reported upon (E. S. R., 74, p. 694).

[Report of work with livestock diseases], W. C. Barry, C. S. M. Hopkirk, et al. (*New Zeal. Dept. Agr. Ann. Rpt., 1935–36, pp. 19–23, 27–33*).—The occurrence of and work of the year with diseases of livestock are reported upon.

***A* spot method of conducting whole-blood agglutination tests with stained antigen,** D. E. Stover (*North Amer. Vet., 18 (1937), No. 1, pp. 17–19, 20, fig. 1*).—A description is given of a simple method for conducting whole blood tests with stained antigen by which ill effects appear to be overcome to a marked degree.

How selective is the habitat of the poisonous Astragalus hylophilus? E. H. Graham (*Ecology, 18 (1937), No. 1, pp. 171, 172*).—A critical discussion of the contribution of Beath previously noted (E. S. R., 76, p. 533).

[Contributions on parasites of animals] (*Jour. Parasitol., 22 (1936), No. 6, pp. 528–530, 531–533, 534, 535, 536, 537, 538–540, 541, 542, 543, 544, 545*).—Contributions presented at the twelfth annual meeting of the American Society of Parasitologists (E. S. R., 74, p. 694) held at Atlantic City, N. J., in December 1936, abstracts of which are presented, include the following: Parasites of Equines in the Panama Canal Zone, by A. O. Foster (p. 528); *Elaeophora poelli* Railliet and Henry 1912 in African Buffalo and Its Taxonomic Affinities, by J. H. Sandground (p. 528); Morphological and Biological Studies on *Tetrameres crami* Swales 1933, an Important Nematode Parasite of Ducks, by W. E. Swales (p. 528) (E. S. R., 76, p. 398); The Value of Esophageal Structures in Nemic Classification, by B. G. Chitwood (p. 528); The Fecundity of Single *Strongyloides ratti* Parasites, by G. L. Graham (p. 529); Effects of Various Physical Factors on the Survival of Eggs and Infective Larvae of the Swine Nodular Worm *Oesophagostomum dentatum*, by L. A. Spindler (p. 529); The Effect of Tropical Sunlight on Eggs of *Ascaris suis*, by L. A. Spindler (pp. 529, 530); Diagnosis and Treatment of Intestinal Parasitism by the Intra-Intestinal Thermal Method, by D. de Rivas (p. 531); Further Studies in Ascarid Nutrition, by J. E. Ackert and A. E. Freeman (p. 531), contributed from the Kansas Experiment Station; Observations Upon the Glycogen Relationships in *Ascaris*, by T. v. Brand (pp. 531, 532); Retention of Guanidine Bases, A Toxic Factor in Trichinosis, by P. D. Harwood, J. T. Cutler, L. A. Spindler, and S. X. Cross (p. 532); A Relationship in Equines Between Age of Host and Number of Strongylid Parasites, by A. O. Foster (p. 532); Studies on Trichinosis—I, The Inci-

dence of Trichinosis as Indicated by Post-Mortem Examination of 300 Diaphragms, and II, Some Correlations and Implications in Connection With the Incidence of Trichinae Found in 300 Diaphragms, both by M. C. Hall and B. J. Collins (pp. 532, 533); Studies on Active Acquired Resistance, Natural and Artificial, in the Rat to Infection With *Strongyloides ratti*, by A. J. Sheldon (p. 533); A Cerebral Coenurus From *Cercopithecus nictitans*, by J. H. Sandground (pp. 533, 534); Some New Cercariae From *Planorbis pfeifferi*, *Melanoides tuberculata*, and *Pseudoglessula boivini*, by A. Porter and H. B. Fantham (p. 534); The Pathology of Two Trematode Infections of *Lymnaea natalensis*, by H. B. Fantham and A. Porter (pp. 534, 535); The Occurrence of *Euryhelmis squamula* (Rudolphi 1819) in the United States, by A. McIntosh (p. 536); The Specific Validity of the Human and Pig *Ascaris*, Based on a Comparative Study of Spermatogenesis and Oogenesis, by L. S. Ritchie (p. 536); Experimental Infestations of Rats and Mice With *Capillaria hepatica*, by G. W. Luttermoser (pp. 536, 537); Effect of Irradiated Ergosterol on Trichinized [*Trichinella spiralis*] White Rats, by W. W. Wantland (pp. 537, 538); Effect of Irradiated Ergosterol and Irradiated Milk on Calcification of Trichina Cysts in Cats, by W. W. Wantland, C. Hansen, and R. E. Feeney (p. 538); Exposure of Three Endoglobular Bovine Parasites [*Anaplasma marginale*, *Babesia argentina*, and *B. bigemina*] to Different Degrees of Temperature, by C. W. Rees (pp. 538, 539); A Twenty-Four Hour Asexual Cycle in a New Strain of *Plasmodium praecox* (*relictum*), by F. Wolfson (p. 539); The Cultivation of *Trichomonas foetus* Free From Bacteria, by J. Andrews (p. 539); *Trichomonas columbae* as a Cause of Death in the Hawk, by R. M. Stabler and H. A. Shelanski (pp. 539, 540); Experimental Amoebiasis in Rats With Cysts of Human Carriers, by H. Tsuchiya (p. 540); The Louse Fly *Lynchia fusca* Parasite of the Owl, *Bubo virginianus pacificus*, a New Vector of Malaria of the California Valley Quail, by W. B. Herms and C. G. Kadner (p. 541); The American Dog Tick or Eastern Rocky Mountain Spotted Fever Tick, by F. C. Bishopp and C. N. Smith (pp. 541, 542); Equine Encephalomyelitis in Western Montana in 1936—A Brief Discussion of the Implications of Arthropod Transmission, by C. B. Philip and H. R. Cox (p. 542); The Life History of *Diphyllobothrium mansonoides*, by J. F. Mueller (p. 543); The House Fly and Fowl Tapeworm [*Choanotaenia infundibulum*] Transmission, by J. E. Ackert and W. M. Reid (p. 543); Progress of Spirochaete Infection in the Developmental Stages of the Host Tick, *Ornithodoros hermsi* Wheeler, by C. M. Wheeler (p. 544); Experimental Studies on the Trematode *Parorchis acanthus* Nicoll., by R. M. Cable (p. 544); and Experimental Studies on *Neascus vancleavei*, by M. S. Ferguson (pp. 544, 545).

Studies on the bionomics and control of the bursate nematodes of horses and sheep.—III, Further observations on the toxicity of urine and some related substances for sclerostome larvae in feces, I. W. Parnell (*Canad. Jour. Res.*, *14* (*1936*), *No. 11*, *Sect. D*, *pp. 172–180*, *figs. 5*).—In continuation of the studies previously noted (E. S. R., 76, p. 392), comparative tests with cow urine have shown that there is considerable variation in its lethal effect on horse sclerostome larvae in manure. "Urine gradually loses its lethal power over a period of months and is useless after a year. Tests on urines of various farm animals are also recorded, as well as on fluid from byres and manure heaps. The chemical composition of urine is discussed, and tests with ammonia and acetone on larvae are described."

Studies on intestinal parasites among wild rats caught in Saint Louis, H. Tsuchiya and L. E. Rector (*Amer. Jour. Trop. Med.*, *16* (*1936*), *No. 6*, *pp. 705–714*).—The findings in 100 rats (*Mus norvegicus* and *M. rattus*) caught in 16 different locations in the city of St. Louis are recorded. The study is

considered to justify the conclusion that wild rats are probably an important factor in human infections with *Hymenolepis nana* and *H. diminuta*, that *Trichinella spiralis* may probably be transmitted from rat to swine and hence to humans, and that these rats may be looked upon as a reservoir for *Endamoeba histolytica*. A list of 21 references to the literature is included.

Anaplasmosis, E. R. Derflinger (*North Amer. Vet., 17 (1936), No. 10, pp. 24–26*).—A report based upon cases observed in Oregon.

A study of blackleg and its complications, F. Breed (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 4, pp. 521–528*).—It is concluded that blackleg, of which *Clostridium chauvei* is the true cause when uncomplicated, may in the field be caused by *C. chauvei* combined with *C. septicus*, and in a few instances, with *C. novyi*.

"From the clinical symptoms manifest and the gross lesions produced it is impossible to distinguish between those produced by *C. chauvei* and those complicated with *C. septicus*. The microscopic examination of affected material of unknown origin is not a reliable means of diagnosing *C. chauvei* infection. Further laboratory procedures should be used to prove the type of infection or infections. The recognized blackleg products marketed by commercial institutions having adequate and reliable scientific staffs will provide a high grade of protection against direct exposures to the organism *C. chauvei*. Efficient products prepared from *C. chauvei* will not give adequate protection to infections of *C. septicus* or *C. septicus* combined with *C. chauvei*. Lambs are susceptible to infections of the *C. chauvei* and *C. septicus* on direct exposure and are suitable animals for testing the efficiency of *C. chauvei* and *C. septicus* immunizing products. A product prepared in accordance with the method outlined by Scheuber [E. S. R., 67, p. 70], or this same method with slight modifications as outlined, will yield a product which will give adequate protection to lambs and probably calves."

The 5-cc dose of *chauvei-septicus* bacterin contains sufficient active principals to protect lambs against a lethal-plus dose of *C. chauvei*, *C. septicus*, and a mixture of the two organisms.

A slow-drying antigen for the Brucella rapid agglutination test, I. F. Huddleson (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 4, pp. 519, 520*).—Need for the introduction of a factor into the *Brucella* rapid agglutination test which will retard drying, since rapid drying of the serum-antigen mixture often interferes with the efficacy of the test, led to the preparation of the slow-drying antigen here considered. "The antigen is prepared according to the method previously described [E. S. R., 72, p. 382] up to the point of determining the proportion of bacterial cells to suspending menstruum. After adjusting the antigen so that the volume of cells is 20 percent of the total volume of the suspending liquid, one-half of the total volume of the antigen is centrifuged again to sediment the cells completely. A quantity of the supernatant liquid equal to 20 percent by volume of the total volume of antigen is removed from the sedimented cells and replaced by glycerin (C. P.). The two parts of antigen then are mixed thoroughly and left standing for 24 hr. before determining its sensitivity to specific agglutinins according to the method previously described. The glycerinated antigen and undiluted serum mixtures dry slowly on the glass plate. Even after the mixture has dried completely the agglutinated particles of antigen remain very distinct, thus enabling the operator to read the results of the tests after many days with a high degree of accuracy."

Purified foot-and-mouth disease virus.—I, Studies on some of its physical properties, I. A. Galloway and W. J. Elford (*Brit. Jour. Expt. Path.,*

17 (1936), No. 3, pp. 187–203, figs. 2).—In work conducted on behalf of the Foot-and-Mouth Disease Research Committee it was found possible "to make preparations of purified foot-and-mouth disease virus in buffered phosphate solution at pH 7.6 by repeated washing on collodion membranes of suitable porosity. These preparations gave a negative reaction in the test for proteins (sulfosalicylic acid test), and had a potency equivalent to the stock filtrates. The stability of purified virus in buffered phosphate solution over a period of about 3 days at 22° C., or 1 mo. at 0°, compared very favorably with that of unpurified virus. After much longer periods the loss in titer of the purified virus was somewhat greater than that of unpurified virus kept under the same conditions. Slight differences were observed in the stabilities of the various preparations of purified virus, doubtless attributable to varying degrees of 'purity' below the limiting concentration of protein detectable by the sulfosalicylic acid test. The purified virus differed from unpurified virus in (1) its relative instability in a digest broth medium, (2) its greater sensitiveness to the photodynamic action of methylene blue, and (3) its greater susceptibility to the lethal action of certain concentrations of alcohol. The filtration behavior of the purified virus suspended in a buffered phosphate medium at pH 7.6 was in every way similar to that of unpurified virus under the same conditions.

"Tests on the survival of purified foot-and-mouth disease virus at the critical pH values 3, 6, and 7.6 showed that, as in the case of the unpurified virus, two zones of relative stability may be demonstrated, separated by a region in which the virus rapidly becomes inactivated. The number of experiments made was not sufficient to decide definitely whether or not any slight alteration in relative stability is shown by the washed virus, but certainly there appeared to be no pronounced displacement of the pH zones of stability. Purified virus dried in vacuo remained infective for at least a week at —4° to 0°."

The transmission of influenza virus to hedgehogs, C. H. STUART-HARRIS (*Brit. Jour. Expt. Path., 17 (1936), No. 4, pp. 324–328, pl. 1*).—The work reported has shown that the influenza virus from man will produce a mild respiratory infection in the hedgehog. "The condition is contagious and has been transmitted in series by direct inoculation through 10 hedgehogs. Recovery from the infection is accompanied by the development of antibodies in the blood, while the virus can no longer be recovered from the respiratory tract. There is no evidence that the hedgehog can develop an inapparent infection and can carry the virus for long periods. No opportunity has yet arisen to test the possibility of direct transmission from human beings with influenza to the hedgehog. Representatives of the Primates, the carnivores, and the rodents have been known for some time to be suspectible to influenza virus. . . . Influenza in the hedgehog resembles the disease as seen in the ferret rather than that in the mouse."

Observations on the effect of louping ill virus on the developing egg, F. M. BURNET (*Brit. Jour. Expt. Path., 17 (1936), No. 4, pp. 294–301*).—The investigation has shown that louping ill virus may be propagated in the developing hen's eggs, producing both local chorioallantoic membrane lesions and general effects upon the embryo. "The number of focal lesions can be used as a sensitive but rather inaccurate indicator of the presence and amount of virus. Serum neutralization tests can be carried out with the egg membrane as the indicator organism, the results agreeing fairly closely with those obtained by the method of intracerebral inoculation in mice. Virus is constantly present in the circulating blood, is in part at least attached to the blood cells, and is liberated from this attachment by the action of distilled water. The lesions observed in the embryo are such as might be accounted for

if the primary effect of this virus is to produce a hemolytic anemia with or without primary damage to liver cells. The almost exclusive viscerotropism of louping ill virus in this situation is discussed."

Rabies in the vampire bat of Trinidad, with special reference to the clinical course and the latency of infection, J. L. Pawan (*Ann. Trop. Med. and Parasitol., 30 (1936), No. 4, pp. 401–422*).—A further contribution on rabies in *Desmodus rotunda murinus* Wagn. (E. S. R., 76, p. 100), in which it is pointed out that this bat may become a carrier of rabies after recovery from the furious form of the disease and remain capable of spreading infection by its bites for prolonged periods.

Trypanosomiasis of stock in Mauritius.—III, The diagnosis and course of untreated T. vivax infections in domestic animals, A. R. D. Adams (*Ann. Trop. Med. and Parasitol., 30 (1936), No. 4, pp. 521–531*).—A continuation of this contribution (E. S. R., 74, p. 849).

Mastitis, IV, V (*New York State Sta. Tech. Buls. 239 (1936), pp. 16; 241 (1937), pp. 21*).—A continuation of this series of studies (E. S. R., 75, p. 542).

IV. *The composition of milk as affected by latent mastitis,* A. C. Dahlberg, J. J. Kucera, J. C. Hening, and G. J. Hucker.—Work was undertaken to determine whether there is a demonstrable relationship between the degree of infection and the chemical composition of milk normal in appearance.

"Only cows having udders free from active inflammation and whose milk was normal in appearance were selected for study. These cows were divided into three groups, viz, (1) no demonstrable infection, (2) slight infection, and (3) pronounced latent infection but milk normal in appearance. Composite milk samples of complete milkings from each of these groups were submitted to detailed chemical analysis. During the course of the study samples of foremilk from each quarter of each cow were studied by bacteriological tests to determine the amount of infection present. Only slight differences in the chemical composition of the mixed milk of these groups were found, regardless of the degree of infection, as long as the milk remained normal in macroscopic appearance. The slight differences in chemical composition included a decrease in lactose, specific gravity, skim milk solids, and curd tension, while the chlorides and albumins were slightly increased. These changes in composition were not greater than variations in chemical composition of milk between two herds of the same breed.

"It is concluded that milk normal in appearance is essentially normal in chemical composition. If no milk is included from inflamed, congested, or injured quarters, the chemical composition of the milk from a herd will be normal in chemical composition. It follows that earlier investigations on the chemical composition of normal milk were not affected by the possible presence of latent mastitis."

V. *The presence of mastitis streptococci in bovine mammary tissue,* G. J. Hucker.—In further studies, the details of which are given in tables, an examination of 24 udders, aseptically removed and cultured, from cows known to be free of the disease and to have passed through one or more lactation periods showed that all contained mastitis streptococci. A similar study made of 21 udders removed from virgin heifers and calves indicated that less than half contained mastitis streptococci in the mammary tissue.

Frequency of mastitis by quarters, F. B. Hadley (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 4, pp. 532, 533*).—In a study made of 400 udder quarters showing well-marked evidence of mastitis, the 2 rear quarters were found more often affected with mastitis than the 2 front quarters, but there was no significant difference in the occurrence of the disease between the right and

the left halves of the udder. When the 2 front quarters were compared with each other and the 2 rear quarters were similarly compared, only a little difference was noted. Of the 153 affected front quarters, 18.5 percent of the right and 19.75 percent of the left were involved; of the 247 affected rear quarters, 30.5 percent of the right and 31.25 percent of the left were involved.

Clinical results in the treatment of so-called functional sterility of cows, C. F. CLARK (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 4, pp. 488–492*).—The author concludes from the limited number of cases reported in this contribution from the Michigan Experiment Station that douches of physiological saline solution and ovarian massage were of value in treating some cases of so-called functional sterility. The use of ovarian extracts in a few cases did not show conclusive value. There was no conclusive evidence that a nutritional factor was involved, received by grazing animals and withheld from those stabled.

Staphylococcic infections of the bovine udder, R. GWATKIN, S. HADWEN, and H. M. LEGARD (*Canad. Pub. Health Jour., 27 (1936), No. 8, pp. 391–400, figs. 2*).—In examinations made of the milk of 260 cows, comprising milk from individual quarters of 236 animals in 8 herds and 24 cows received from other herds on account of udder trouble, 143 cases of mastitis were detected. "Ninety-four were infected with streptococci and 4 with other bacteria. In 15 the cause was not determined, while in 30 staphylococci were incriminated. Twenty of the 30 cases of staphylococcic mastitis occurred in 2 herds in which staphylococci were the only pathogenic organisms isolated. Swelling or induration was detected in 21 of these animals in one or more quarters. Fourteen of 18 cows in 1 herd were affected. The milk of all was abnormal by the bromothymol-blue or rennet test, and the udders of 12 showed indurations. Therefore, in addition to its occurrence in sporadic cases, staphylococcic mastitis also occurs as a herd infection. Two cases were severe, and one of these had a fatal termination. The other animals showed no constitutional disturbance at time of examination.

"One hundred and thirty-one cultures of staphylococci from udders were examined. All fermented lactose. Five failed to ferment maltose. Forty-six strains fermented glycerol. Ninety-four fermented mannitol. Only 5.3 percent of the mannitol positive strains were isolated from apparently normal udders, and 46 percent of the mannitol negative strains came from this source. Toxin was produced in semisolid medium by 41 of 80 strains tested. Thirty-one were mannitol negative and 10 of these produced toxin (32.2 percent). Forty-nine were mannitol positive and 31 of these produced toxin (63.2 percent). Three of 44 filtrates proved fatal for guinea pigs by intracardiac injection. No relationship was observed between toxin production and clinical severity. Toxin was produced by 67.4 percent of the strains recovered from cases of staphylococcic mastitis and from 20 percent of the strains from normal udders. A strain of *Staphylococcus aureus* producing a small highly colored colony persisted in one quarter of an udder for 6 mo. The other quarters yielded the commoner type of this organism. There was no admixture of strains. The small colony type was a stronger toxin producer than the others. Attention is drawn to work which suggests the possible public health importance of staphylococcic mastitis."

Sheep diseases, F. E. HULL and W. W. DIMOCK (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 4, pp. 469–478*).—A practical summary of information from the Kentucky Experiment Station, presented at the annual meeting of the American Veterinary Medical Association at Columbus, Ohio, in August 1936.

Enzootic abortion in ewes.—A preliminary note, J. R. GREIG (*Vet. Rec., 48 (1936), No. 42, pp. 1225–1227*).—A description is given of a form of enzootic abortion in ewes. The conditions of the occurrence of the disease suggest that it is associated with local environmental factors.

The efficiency of commercial lamb dysentery serum, R. F. MONTGOMERIE and W. T. ROWLANDS (*Vet. Rec., 48 (1936), No. 50, pp. 1481–1483*).—A report is made of an investigation of the antitoxic value of five commercial brands of lamb dysentery serum, two of British and three of foreign origin. "One British and one foreign brand contained antitoxins capable of neutralizing the toxin produced by *Cl[ostridium] welchii*, type B (the lamb dysentery bacillus), in all its growth phases. One British brand was distinctly deficient in antitoxin capable of neutralizing one of the main toxic fractions of *C. welchii*, type B, and two foreign brands contained no detectable antitoxin."

The control of the lesser stomach worm in sheep, D. ROBERTSON (*Scot. Jour. Agr., 19 (1936), No. 4, pp. 359–363*).—The treatment of lambs with copper sulfate and nicotine sulfate, carbon tetrachloride, and copper sulfate and arsenic in capsule or tablet form had no effect on *Ostertagia* spp. It is concluded that the low nutritive value of pastures in autumn will hinder the progress of lambs and render them more susceptible to parasitic infestation. In the treatment of ostertagiasis greater reliance should be placed on the provision of concentrates than the administration of anthelmintics.

The nematodes and certain other parasites of sheep, S. B. FREEBORN and M. A. STEWART (*California Sta. Bul. 603 (1937), pp. 75, figs. 17*).—The authors have prepared a practical summary of what is known of the life history of the various nematode and a few other parasites affecting sheep, together with methods of treatment. Tables for the separation of the forms considered, their synonymy, notes on their biology, etc., are included.

Studies on the toxicity of blighted barley to swine, J. J. CHRISTENSEN and H. C. H. KERNKAMP (*Minnesota Sta. Tech. Bul. 113 (1936), pp. 28, figs. 3*).—Of the many plant pathogens associated with blighted barley in Minnesota which are toxic to swine, species of *Alternaria*, *Helminthosporium*, and *Fusarium* were the fungi most commonly isolated. There were striking differences in the prevalence of these fungi on different lots of blighted barley from different localities in the same year and also from the same locality in different years. Barley distinctly blighted by *Fusarium* came from the southern part of the State only.

"The relative toxicity of different lots of grain was determined by making a water extract and administering it to pigs orally via stomach tube. An extract of 15 g (about ½ oz.) of scabby kernels was sufficient to make a pig weighing 100 lb. vomit. Sterile extracts made from scabby barley and injected intravenously and intraperitoneally caused the pigs to sicken. Extracts from pure cultures of *Fusarium* spp. grown on various substrata were not toxic to pigs. However, pure cultures of *Fusarium*, *Alternaria*, *Chaetomium*, and *Penicillium*, *Helminthosporium*, and bacteria, when grown on steamed barley, were refused by pigs unless mixed with other food.

"It was demonstrated by feeding tests with pigs that *Fusarium graminearum* produces a toxic principle in wheat, barley, and corn if inoculated at time of grain formation. The toxic principle may persist in whole barley for at least 3 yr. It is water soluble and thermostable. The amount of toxic principle present in scabby barley usually is proportional to the degree of shriveling. Many of the most toxic kernels can be removed by fanning thoroughly or by immersing the grain in water and then skimming off the blighted seeds that float on the surface.

"Feeding tests were made with 23 lots of barley graded either scabby or blighted and with 5 lots of sound barley (controls). Barley blighted primarily with *Helminthosporium* and *Alternaria* was not toxic to pigs, although it contained as much as 31 percent by weight of blighted kernels. The feeding value of barley was reduced considerably when 10 percent of scabby kernels were added to sound barley. Barley naturally infected with 16 percent scab was extremely toxic to pigs, while pigs refused to eat barley with 32 percent scab infection by weight.

"Pigs affected with *Fusarium* poisoning lose their appetites, become listless, weak, sometimes vomit, and may even die. An overdose of an extract of *Fusarium*-infected corn caused the death of two pigs. There is some indication that the toxic extract of scabby barley may be somewhat detoxicated under certain conditions by the addition of milk, starch, and other materials. Some of the toxic principle can be removed by soaking and washing the infected grain."

It is pointed out that these investigations indicate a need for further information on the utilization of scabby barley as feed for swine.

A list is given of 23 references to the literature cited.

Production of so-called alkali disease in hogs by feeding corn grown in affected area, H. W. Schoening (*North Amer. Vet., 17 (1936), No. 9, pp. 22–28, figs. 4*).—A report is made of two typical cases of so-called alkali disease produced in hogs by feeding corn grown in an area where the disease has occurred naturally. "The symptoms and lesions produced in the experimentally fed hogs were typical of those seen in hogs naturally affected in certain areas of the Great Plains States. Symptoms of the disease began to appear a few weeks after the beginning of experimental feeding of corn from the alkali disease area. Symptoms became more severe with continued feeding of such corn.

"Chemical analysis of the corn indicated that selenium is a responsible factor in the production of the condition. Both lots of corn grown in the affected area contained selenium, one in the proportion of 10 p. p. m., the other 5 p. p. m., whereas no selenium was found in the normal or control corn. Furthermore, the two hogs which became affected were fed on the lot of corn containing the largest amount of selenium (10 p. p. m.)."

Effect of ferrous sulphate and copper sulphate on experimental infection of pigs with the nodular worm, Oesophagostomum dentatum, L. A. Spindler (*North Amer. Vet., 17 (1936), No. 12, pp. 29–32*).—The results in four tests of the daily administration of 3.7 cc of a dilute aqueous solution of ferrous sulfate and copper sulfate to pigs infected experimentally with the nodular worm *O. dentatum* are reported upon. "The experimental pigs had been farrowed and raised indoors and were all suffering from secondary or nutritional anemia at the beginning of the tests. In all of the tests the pigs receiving the iron-copper solution gained weight more rapidly and were in better physical condition at the termination of the tests than were the control pigs. In spite of the fact that the test pigs remained in better physical condition than the controls, the former were infested in each case with a greater number of nodular worms at necropsy than the pigs that did not receive iron and copper."

A study of the blood-grouping factors in horses, V. A. Herman (*Jour. Immunol., 31 (1936), No. 5, pp. 347–353*).—A study conducted by the Ukrainian Institute of Experimental Medicine, Kharkov, is reported. "A comparison of the species- and group-specific agglutinins in the blood of the horse and of man has demonstrated a resemblance between the blood groups of the two

species, not only in regard to the interagglutinative mechanism but also in regard to the group factors, agglutinins and agglutinogens, themselves. After removal of the species-specific agglutinins by adsorption, both human serum and horse serum showed group-specific agglutination of either human erythrocytes or horse erythrocytes. This reciprocal interaction shows the similarity of the agglutinogens and agglutinins in man and in the horse. Certain internal organs of the horse contain group components corresponding to those of the blood. The similarity of the group factors in man and the horse, and the quantitative differences in agglutinative titer are interesting biologically, and suggest the desirability of similar systematic comparisons of the blood of other species. Our studies furnish a systematic basis for a nomenclature of equine blood groups."

A list of 40 references to literature is included.

Equine encephalomyelitis in Panama, R. A. Kelser (*[War Dept. U. S.], Off. Surg. Gen., Vet. Bul., 31 (1937), No. 1, pp. 19–21*).—This report of encephalomyelitis in an artillery horse at Fort Clayton, C. Z., from which the eastern type of the virus was isolated, is said to be the first record of its occurrence in Panama. The 10-year-old horse in which the disease appeared was born and raised in Nebraska and shipped to the Canal Zone in 1930.

Pyosepticemia of foals due to Bacillus abortivo equinus, R. T. Seymour (*[War Dept. U. S.], Off. Surg. Gen., Vet. Bul., 30 (1936), No. 4, pp. 277–282*).—It is concluded that even when the most rigid sanitary measures are practiced, pyosepticemia of foals on farms where equine infectious abortion has recently occurred may be due to prenatal infection and perhaps more frequently to postnatal infection with *B. abortivo equinus*. It is pointed out that the symptoms and pathological changes noted on autopsy closely resembled many of the other types of infections of foals. There appears to be no accurate clinical differentiation of this type of infection from other infections of foals.

Verminous aneurysm in equines of Panama, A. O. Foster and H. C. Clark (*Amer. Jour. Trop. Med., 17 (1937), No. 1, pp. 85–99, pls. 3*).—Post-mortem studies of over 200 equines in Panama revealed an active verminous arteritis or aneurysm in about 80 percent of the cases. The disease was encountered in animals of all ages, in both native and imported stock, and in horses, mules, and burros. The typical lesion affected the anterior mesenteric artery and was characterized by tortuosity, sclerosis, thrombosis, and diminished caliber. Usually there were less than 10 worms—larvae of *Strongylus vulgaris*—in the lesions. Many of the animals covered in this survey were condemned because of unserviceableness, although a larger proportion was reasonably representative stock of this locality. The probable effect of verminous arteritis upon the efficiency of equines is emphasized, and the prerequisites for the type of control needed in this region are outlined.

A quantitative study of the nematodes from a selected group of equines in Panama, A. O. Foster (*Jour. Parasitol., 22 (1936), No. 5, pp. 479–510*).—Data are presented on the qualitative and quantitative occurrence of nematode parasites recovered at autopsy from 48 horses and mules imported into the Panama Canal Zone and used by the U. S. Army.

Canine endoparasites, H. M. Cobenzwit (*North Amer. Vet., 17 (1936), No. 11, pp. 37–40, 41*).—A report is made of the findings at autopsies performed in Philadelphia on 200 stray canines taken at random from among several thousand that were destroyed during a city-wide quarantine against rabies in January, February, and March 1936. Of the 86 percent that were found to be parasitized, 69.5 percent were infested with whipworms (*Trichuris vulpis*),

52 with tapeworms (*Dipylidium* and *Taenia* spp.), 17 with hookworms (Ankylostomae), 17 with large intestinal roundworms (Ascaridae), 14 with heartworms (*Dirofilaria immitis*), and 0.5 percent with an acanthocephalid (*Oncicola canis*).

A note on the occurrence of the heartworm, Dirofilaria immitis, in the eye of a dog, J. E. Alicata and R. H. Morrison (*North Amer. Vet., 17 (1936), No. 11, pp. 41, 42*).—A report of an observation of the heart worm in Hawaii.

Skin scabies or mange of the fox, P. J. G. Plummer (*Canada Dept. Agr. Pub. 502 (1936), pp. 8, pl. 1, figs. 2*).—A practical account of the itch mite, the only acarid found to parasitize foxes in Canada, the nature of the affection resulting from its parasitism, and preventive and control measures.

Dioctophyme renale in mink, E. F. Graves (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 4, pp. 531, 532, fig. 1*).—This is a case report of a 1-year-old male mink, the death of which was caused by the kidney worm of carnivores.

[Work in avian pathology by the Iowa Station] (*Iowa Sta. Rpt. 1936, pt. 1, pp. 94, 95, 146–148*).—The work of the year with diseases of poultry briefly referred to (E. S. R., 75, p. 102) includes the etiology of range paralysis and the egg as a possible mode of its transmission, both by C. Murray, C. D. Lee, and H. L. Wilcke; breeding for resistance to fowl typhoid, by W. V. Lambert and N. F. Waters; and genetic investigation of resistance and susceptibility to typhoidlike diseases in laboratory animals, by Lambert.

Studies on certain filtrable viruses.—I, Factors concerned with the egg propagation of fowl-pox and infectious laryngotracheitis, C. A. Brandly (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 4, pp. 479–487*).—The susceptibility of the developing avian egg to infection, the inoculation of eggs of various species with infectious laryngotracheitis virus, factors influencing the infectivity or virulence of fowl pox and of laryngotracheitis virus for developing eggs, and the effect of continued egg passage upon infectivity and filtrability of the viruses are considered in this contribution, the author's findings being based upon work conducted in part at the Kansas Experiment Station and in part by the division of animal pathology and hygiene, University of Illinois.

It is concluded that the finding of variations in susceptibility to infection among different species, as well as within the species of egg employed, may bear considerable significance. Various factors influence the infective potency or virulence of fowl pox and infectious laryngotracheitis viruses insofar as continued egg propagation is concerned, and failure to recognize such factors may complicate the application of the relatively simple technic of developing egg cultivation of the viruses.

The immunological relationship between Kikuth's canary virus and fowl-pox, F. M. Burnet and D. Lush (*Brit. Jour. Expt. Path., 17 (1936), No. 4, pp. 302–307*).—The authors have found that the viruses of fowl pox and Kikuth's canary disease can be accurately titrated by the pock-counting method on the chorioallantoic membrane. Cross-neutralization tests indicate that the two viruses, though not identical, are serologically very closely related. There is no cross reaction with vaccinia virus.

Attenuation of the fowl pest virus by X-ray [trans. title], B. S. Levin and I. Lominski (*Compt. Rend. Acad. Sci. [Paris], 203 (1936), No. 3, pp. 287, 288*).—The authors have found that the pathogenicity of the fowl pest virus can be completely attenuated by X-ray irradiation at a dosage of from 1.5 to 2 million r-units.

The etiology of fowl paralysis, leukemia, and allied conditions in animals, V, VI, M. W. EMMEL (*Florida Sta. Bul. 305 (1936), pp. 66, figs. 4*).—The continuation of this contribution (E. S. R., 75, p. 547) is presented in two parts.

V. *The oral exposure of chickens infected with various species of Eimeria (Coccidia) to Salmonella aertrycke* (pp. 5–44).—Experiments are reported which show that the inflammation created by coccidia in the intestinal tract of the chicken creates an avenue of infection for the causal micro-organism, in the present case *S. aertrycke*.

"The single intravenous injection of *S. aertrycke* into 20 8-weeks-old parasite-free birds resulted in one case of fowl paralysis. The repeated daily oral exposure of parasite-free 10-weeks-old birds to *S. aertrycke* for periods of 30 and 90 days resulted in hemocytoblastosis but no other pathologic manifestation. The single oral exposure of 20 parasite-free 2-weeks-old chicks to *S. aertrycke* resulted in one case of fowl paralysis. The repeated (three doses) oral exposure of 20 parasite-free 2-weeks-old chicks to the same causal micro-organism resulted in two cases of fowl paralysis and one case of lymphatic erythroleucosis. The oral exposure of birds previously artificially parasitized to *E. praecox*, *E. necatrix*, and *E. maxima* and two groups of naturally parasitized birds affected with mixed coccidial infection to *S. aertrycke* resulted in a high percentage of cases of the pathologic manifestations, i. e., fowl paralysis, 'light' and anemia, lymphomatosis, and leukemia. Fifty-two of 90 birds so exposed developed one of the pathologic manifestations, more cases developing in naturally parasitized birds than in the ones artificially parasitized.

"Two experiments are reported which indicate that partial recovery or recovery from hemocytoblastosis results in a certain degree of immunity and that exposure shortly thereafter to *S. aertrycke* failed to cause a development of pathologic manifestations even though the birds were affected with a mixed coccidial infection at the time of exposure to the causal micro-organism. There was a relative increase in the length of the incubation period with advancement in age. The incubation period for fowl paralysis varied from 17 to 63 days, lymphomatosis from 45 to 104 days, erythroleucosis from 73 to 91 days, myeloid leukemia from 81 to 104 days, and light and anemia 14 days."

VI. *The oral exposure of chickens infested with Ascaridia, Taenia, and Capillaria to Salmonella aertrycke* (pp. 45–63).—Sixty-two of 98 birds that were orally exposed to *S. aertrycke* during chronic intestinal parasitism by *Ascaridia*, *Taenia*, and *Capillaria* developed one of the pathologic manifestations, 5 others developed a complication of two manifestations, and 24 control birds remained normal. "The incubation period for fowl paralysis was 29 to 57 days, lymphomatosis 52 to 85 days, light and anemia 18 days, myeloid leukemia 70 to 172 days, and erythroleucosis 86 to 171 days. Four complicated cases of fowl paralysis and leukemia developed in 54 to 86 days, while one case of fowl paralysis and lymphomatosis developed in 58 days."

The details of this contribution in 18 tables and a list of 44 references to the literature cited are included.

Leucemia of fowls, C. A. BRANDLY, R. GRAHAM, and V. M. MICHAEL (*Illinois Sta. Circ. 467 (1937), pp. 14, figs. 10*).—A practical account of leukemia which has, during the last few years, become one of the most serious diseases affecting poultry flocks in Illinois. It is pointed out that, while chickens of all breeds and ages are susceptible to the disease, the largest percentage of infections has been observed in birds between the ages of 2 and 18 mo. Leukemia occurs in both acute and chronic forms and is usually fatal. The symptoms

and lesions are highly variable, making diagnosis difficult in many cases. Prevention is based upon general sanitary measures of disease control.

Studies of incubation factors in the agglutination test for pullorum disease, H. M. DeVolt and C. R. Davis (*Maryland Sta. Bul. 402 (1936), pp. 165–176*).—A report is made of a study of some incubation factors in the tube agglutination test for pullorum disease as regards the possible effect of variations in incubation methods, including manner of heating the tubes, incubation temperature, and length of the incubation period.

The work has led to the conclusion that convection currents induced by warm spots on the bottom or sides of a test tube are responsible for the failure of plain antigen suspensions and negative tests to settle out when placed close to the heating elements of an incubator or on a warm surface.

"This effect was sufficiently strong to cause slight inhibition of the agglutination reaction in 65 percent of a group of tests placed in the small incubator at 37.5° C. Inhibiting of the test became more pronounced with the rise in temperature. The speed of the reaction was increased at temperatures of 45° and 55° but not at 37.5°, 65°, or 75° in the small incubator. Cloudy reactions occurred to a marked extent at 65°. The effect of time was at a minimum in changing the interpretation of tests after the 24-hr. reading."

Intradermal avian tuberculin test in ducks, J. F. Craig and G. O. Davies (*Vet. Rec., 49 (1937), No. 2, pp. 29, 30*).—The tests of ducks with avian tuberculin here reported have led to the conclusion that the tuberculin test as applied intradermicly to the web of the duck's foot is of no practical value in the diagnosis of tuberculosis.

AGRICULTURAL ENGINEERING

Report of committee on engineering experiment stations, Association of Land-Grant Colleges and Universities, at meeting of engineering section in Houston, Texas, November 1936 (*Assoc. Land-Grant Cols. and Univs., Engin. Expt. Sta. Rec., 17 (1937), No. 1, pp. 8–12*).—This report contains statistical data relating to full and part time personnel and funds available at the engineering experiment stations during the fiscal year 1936–37 and funds available at the agricultural experiment stations for engineering research for the same period.

[Agricultural engineering investigations by the Iowa Station], H. Giese, J. B. Davidson, E. V. Collins, Q. C. Ayres, E. G. McKibben, C. K. Shedd, A. A. Bryan, P. E. Brown, and H. R. Meldrum (*Iowa Sta. Rpt. 1936, pts. 1, pp. 46–51, fig. 1; 2, pp. 20–24*).—Progress results are briefly presented in part 1 of investigations on farm fires and the effectiveness of spark arresters, the all-masonry barn, equipment for checkrowing beets, soil erosion control, utilization of clay products in farm building construction, and the kinematics and dynamics of transport wheels used on agricultural equipment; in part 2 of investigations of the basin method of growing corn, a dual pneumatic tire attachment for use on a tractor when cultivating corn, accuracy of the four-row checkrowers, wagon and trailer hitches with telescoping tongues, efficiency of experimental snapping rolls for corn pickers, a disk joiner for seedbed preparation, comparative merits of a plow, a pulverator, and disk harrow and duckfoot type cultivators for seedbed preparation, and spacing distances for checked corn.

Surface water supply of the United States, 1935, Parts 5, 6, 9 (*U. S. Geol. Survey, Water-Supply Papers 785 (1936), pp. 283, pl. 1; 786 (1936), pp. 353, pl. 1; 789 (1937), pp. 174, pl. 1*).—These papers present the results of

measurements of flow made on streams during the year ended September 30, 1935, No. 785 covering the Hudson Bay and upper Mississippi River Basins, No. 786, the Missouri River Basin, and No. 789 the Colorado River Basin.

Daily river stages at river gage stations on the principal rivers of the United States, compiled by M. W. Hayes (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 33 (1935), pp. III+162*).—This volume contains data for 1935 (E. S. R., 75, p. 111).

Water, its use and control in Kansas: An outline (*Topeka: Kans. State Planning Bd., 1936, pp. 28, [figs. 14]*).—This report of the Kansas State Planning Board presents a general picture of ways for the better utilization and control of water in the State and suggests steps that must be taken to bring about such betterments.

Water duty trials in the Sudan Gezira, H. Greene (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 168–171, fig. 1*).—As a general summary of the experiments here briefly recorded, "it may be said that during the period of vigorous vegetative growth and increasing severity of climate, light or infrequent waterings are injurious, but heavy or frequent waterings, though conferring benefit on the crop, do not produce the large increase of yield that might be expected. It appears that the rather low permeability of Gezira soil sets at this stage a limit to the utilization of irrigation water, of which only a part sinks at all deeply into the soil while the rest remains on or near the surface and is more or less wasted. On the other hand, if water is abundant and cheap, there is practically no risk of reducing the yield by heavy irrigation."

Characteristics of transverse Pitot tubes, J. E. Christiansen and O. C. French (*Agr. Engin., 18 (1937), No. 1, pp. 21–24, figs. 6*).—Tests made at the California Experiment Station on four transverse tubes of different sizes, an improvised Pitot tube, and a tube for determining static pressure are reported. The diameters of the transverse tubes varied from 0.125 to 0.3125 in., and the orifice diameters of all six tubes varied from 0.052 to 0.116 in.

Series A tests were made with both stuffing boxes screwed into tapped holes (0.25-in. pipe size) in the sides of the pipe. Series B tests were made with the stuffing boxes screwed into 0.25-in. pipe couplings soldered to the outside of the pipe 45° from the tapped holes. A test on the 0.3125-in. tube, series C, was made with the other 0.3125-in. tube in position 3 ft. 1.5 in. upstream. In this test the planes of the two tubes intersected at an angle of 45°. Another test, series D, was made with the improvised Pitot tube.

Negative pressures on the downstream side of transverse tubes were generally greater than positive pressures on the upstream side. Velocity transverses with the orifice upstream were identical for all tubes, regardless of size, and were similar to those obtained with an improvised conventional type Pitot tube. Mean velocities computed from these traverses agree with the end cap orifice measurement. Orifice-downstream traverses were affected by the position of the stuffing boxes with respect to the pipe wall. Mean velocities computed from these traverses approximate the velocities calculated from net pipe areas after deducting for areas occupied by the tubes.

Tests indicate that velocities determined from the mean head for orifice-upstream and orifice-downstream positions should be corrected for half the area occupied by the tube. Positions of mean velocity were found to average 0.78 of the radius from the center of the pipe. Average differences between velocities at 0.707 R and mean velocities were +3 percent for orifice-upstream traverses and +1 percent for mean-head velocity curves. Static pressure connections made by drilling holes through the pipe wall were not reliable before

the burrs were removed. A bushing screwed in a tapped hole gave erroneous results, but a static pressure tube inserted in a tapped hole proved satisfactory for static pressure determinations. When properly used, transverse Pitot tubes are reliable devices for measuring the flow of water in pipes. The tests indicate that measurements within 1 percent of the true discharge are possible.

Conservation of land and water resources of Nebraska, G. E. CONDRA (*Nebr. Univ., Conserv. and Survey Div., Conserv. Dept. Bul. 14* (*1936*), *pp. 46, figs. 8*).—This is a general discussion.

Public Roads, [**March and April 1937**] (*U. S. Dept. Agr., Public Roads, 18* (*1937*), *Nos. 1, pp.* [*2*]+*23*+[*1*], *figs. 23; 2, pp.* [*2*]+*25–52*+[*1*], *figs. 24*).—These numbers contain data on the various highway projects as of February 28 and March 31, 1937, respectively. No. 1 also contains an article entitled The Theory of Soil Consolidation and Testing of Foundation Soils, by L. A. Palmer and E. S. Barber (pp. 1–20), and No. 2, The Effect of Vibration on the Strength and Uniformity of Pavement Concrete, by F. H. Jackson and W. F. Kellermann (pp. 25–49).

Alcohol-gasoline as motor fuel, G. EGLOFF and J. C. MORRELL (*Indus. and Engin. Chem., 28* (*1936*), *No. 9, pp. 1080–1088, figs. 9*).—It is brought out in this contribution that alcohol-gasoline has no over-all technical advantages compared to gasoline. The increased fuel consumption of a 10-percent alcohol-gasoline blend is approximately 4 percent higher than gasoline alone, based on both road and block tests. The improvement in antiknock value and consequent efficiency when alcohol is added to gasoline (employing suitable design and operating conditions) is less than the decrease in efficiency as measured by fuel consumption. The over-all effect is an increased fuel consumption. The use of alcohol-gasoline introduces operating difficulties, especially in starting, acceleration, and vapor lock. The handling and shipment of alcohol-gasoline are difficult because of the ease with which these components separate when traces of water are introduced. It is difficult to keep water out of bulk or storage tanks, filling-station tanks, and motorcar tanks. The cost of alcohol-gasoline is much higher than gasoline alone.

Alcohol-gasoline blends, L. M. CHRISTENSEN (*Indus. and Engin. Chem., 28* (*1936*), *No. 9, p. 1089–1094, figs. 4*).—This contribution presents data to show that various types of alcohol blends are in common use in practically every country, the usual blends distributed commercially containing from 5 to 25 percent of ethanol or of methanol and ethanol. Anhydrous ethanol is miscible with gasoline in all proportions; methanol ordinarily requires the addition of a stabilizer, ethanol being entirely satisfactory for this purpose.

Properly prepared alcohol blends containing not more than about 25 percent of alcohol by volume may be used interchangeably with gasoline of equal antiknock rating. Such blends may safely be stored and distributed in modern commercial equipment. Used in this type of blend the alcohols are not substitutes for gasoline but serve the purpose of increasing the antiknock value and otherwise improving the fuel. It is on this basis that the value of these alcohols must be determined.

Engine performance with gasoline and alcohol, L. C. LICHTY and E. J. ZIURYS (*Indus. and Engin. Chem., 28* (*1936*), *No. 9, pp. 1094–1101, figs. 10*).—This paper deals with the power, fuel consumption, and other performance characteristics of internal-combustion engines when using gasoline and ethyl alcohol as fuels. Theoretical analysis shows ideal possibilities ranging from 2.0 percent increase in power with gasoline compared to pure alcohol to 8.6 percent

increase with pure alcohol compared to gasoline, depending upon mixture conditions.

The water in 190-proof ethyl alcohol has a negligible effect on power but increases the specific fuel consumption about 6.6 percent, owing to lowered heating value per given quantity of fuel compared to pure alcohol. Tests on a variable-compression single-cylinder C. F. R. engine and on a 1935 Chevrolet engine under various conditions show a small average increase in power (not much more than experimental error involved) in favor of the 190-proof alcohol. However, the specific fuel consumption with 190-proof alcohol is about 60 percent higher on a weight basis and about 50 percent higher on a volume basis than with gasoline.

Utilization of ethanol-gasoline blends as motor fuels, O. C. Bridgeman (*Indus. and Engin. Chem., 28 (1936), No. 9, pp. 1102–1112, figs. 4*).—In this contribution from the Federal Bureau of Standards data are presented to show that blends containing ethyl alcohol have no material advantage over gasoline as motor fuels, although they can be utilized satisfactorily if full advantage is taken of the available technical information. Small percentages of ethyl alcohol in the blend are more advantageous than large percentages from the standpoints of maximum power and acceleration for minimum fuel consumption and of ease of engine starting and warming. The reverse is true from the standpoints of vapor lock and of water tolerance. A compromise may therefore be necessary from the technical standpoint in determining the composition of the blend most suitable for any particular purpose.

The alcohol used for blending should be essentially anhydrous in order to prevent separation of the alcohol in service. By employing a suitable blending agent the water tolerance of the blend can be markedly increased, although the ethyl alcohol used must still be practically anhydrous unless very large percentages of blending agent are employed.

Rothamsted measurements comparing fuel and electricity as a source of power, G. H. Cashen and B. A. Keen (*[Rothamsted Expt. Sta., Harpenden], Rothamsted Confs. No. 21 (1936), pp. 60–69*).—These investigations had for their purpose to show, for typical farming operations, how many units of electricity are equivalent to 1 gal. of kerosene, gasoline, or heavy fuel oil. Threshing experiments with oats, wheat, and barley showed that for conditions at Rothamsted electricity is a cheaper form of power than fuel oil in a tractor. Feed-grinding experiments were in favor of a Diesel motor using fuel oil.

"Electric power—how to obtain it and how best to use it", M. M. Harvey (*[Rothamsted Expt. Sta., Harpenden], Rothamsted Confs. No. 21 (1936), pp. 8–41*).—The general purpose of this paper is to indicate how English farmers who are within reach of a public electricity supply may obtain the greatest benefits for their outlay of capital and to point out the general trend of electric farming development as related to the various types of farms.

Wiring and motors are briefly touched upon in their technical aspects, and general information is given on rates with particular reference to reasons for variations. The types of farms using electricity are tabulated with some specialized applications, and the various appliances are discussed at greater length. Other sections deal with private plants, the verdict of farmers already using electricity, some details of actual installations, tables of running costs, and other data collected from various sources and authorities.

Electric motors for farm machinery, F. E. Rowland (*[Rothamsted Expt. Sta., Harpenden], Rothamsted Confs. No. 21 (1936), pp. 42–53, figs. 14*).—Technical information on motor adaptations to farm machinery is presented.

Farm wiring, C. A. CAMERON BROWN (*Oxford: Univ. Oxford, Inst. Res. Agr. Engin., 1935, pp. 32, pls. 4*).—This is a semitechnical discussion of wiring systems with suggestions as to the most satisfactory for farm buildings.

Pneumatic equipment for farm tractors, A. HAY (*Rubber Growers' Assoc., Rubber and Agr. Ser. Bul. 1 (1936), pp. 18, figs. 12*).—The use of pneumatic tires for tractors used in English farming is described and illustrated.

Pneumatic equipment for horse drawn vehicles, A. HAY (*Rubber Growers' Assoc., Rubber and Agr. Ser. Bul. 2 (1936), pp. 20, figs. 22*).—Wagons and carts used on farms in England and equipped with pneumatic tires are described. Tests with carts showed that pneumatic tires permitted the carrying of heavier loads at a saving in time.

Methods of hedge and tree-stump clearing, T. SWARBRICK (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 101 (1936), pp. V+16, figs. 11*).—This brief account of methods now in use in England includes hand-operated and power pullers, explosives, and chemicals.

Safety in the handling and use of explosives (*U. S. Dept. Agr., Soil Conserv. Serv., 1936, R5-Ms-5, pp. [5]+27, figs. 4*).—Popular information on the subject is presented.

Water supply for orchards, B. A. JENNINGS (*N. Y. State Col. Agr., Cornell Ext. Bul. 367 (1937), pp. 30, figs. 22*).—Technical information of a practical character is given on storage, pumping, and distribution of water for orchards.

A weed eradication program (*Reclam. Era [U. S.], 27 (1937), No. 2, pp. 36, 37, figs. 2*).—In this brief article a single blade weed eradicator is described and diagrammatically illustrated, and brief specifications are given.

The uses of rubber in commercial horticulture, A. HAY and D. F. C. VOSPER (*Rubber Growers' Assoc., Rubber and Agr. Ser. Bul. 6 (1937), pp. [1]+16, figs. 18*).—These uses include pneumatic tires for garden tractors; rubber-jointed tracks for track laying type tractors; and rubber tires for spraying equipment, wheelbarrows, and planting and harvesting equipment.

The uses of rubber in stable management, A. HAY (*Rubber Growers' Assoc., Rubber and Agr. Ser. Bul. 5 (1936), pp. [1]+14, figs. 14*).—Uses of rubber, such as for stall floors and walls, collars, saddles, horseshoes, and stable barrows, are briefly described and illustrated.

The care and cleaning of milking machines, A. HAY (*Rubber Growers' Assoc., Rubber and Agr. Ser. Bul. 4 (1936), pp. [1]+16, figs. 13*).—Practical information is given on the subject.

Instruments for farm structures research, W. V. HUKILL (*Agr. Engin., 18 (1937), No. 2, pp. 59–61, figs. 2*).—In a brief contribution from the U. S. D. A. Bureau of Agricultural Engineering some of the more important technical apparatus used in farm structures research is described.

Principles of heating, ventilating, and air conditioning, A. M. GREENE, JR. (*New York: John Wiley & Sons; London: Chapman & Hall, 1936, pp. VII+446, figs. 254*).—This handbook contains chapters on methods of application; properties and conditioning of air; loss and gain of heat through walls; radiators, valves, and heat transmission from radiators; method of calculating heat required for rooms; direct steam heating; hot water heating; indirect steam heating, air flow, and gravity systems; indirect steam heating, plenum system, and air conditioning; unit heaters and air conditioning; warm air furnace heating; furnaces, boilers, and heaters; automatic controls; and district heating.

Refrigeration for the farm and dairy, C. A. CAMERON BROWN (*Oxford: Univ. Oxford, Inst. Res. Agr. Engin., 1936, pp. 51, pls. 6*).—This publication includes practical information on different types of small cooling plants, their methods of application, and differences in operation and running costs.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Delaware Station, 1935–36] (*Delaware Sta. Bul. 205 (1936), pp. 9–14, figs. 2*).—Results in investigations not previously noted include findings by R. O. Bausman on 182 commercial poultry farms as to the effects of artificial lights on annual and seasonal production of eggs, costs, profits, size of eggs, etc., and by H. S. Gabriel in a study of retail marketing of apples as to seasonal demand for, relative prices of varieties, and competition of other fruits in 25 chain stores in Philadelphia.

[Investigations in agricultural economics by the Iowa Station, 1935–36] (*Iowa Sta. Rpt. 1936, pts. 1, pp. 174–185, 186–189, 190, figs. 3; 2, p. 59–64, fig. 1*).—Findings in investigations not previously noted are reported as follows: Part 1, by J. A. Hopkins, C. Malone, and C. Y. Cannon as to cash operating and fixed expenses, net farm income, etc., in 1935 on 71 farms in the northeastern dairy area of the State; by R. C. Bentley, T. W. Schultz, and W. G. Murray as to the number of farm sales and average sales price per acre in 11 counties from July 1934 to November 1935; by M. G. Reid as to the space devoted to different kinds of advertising in farm and general magazines and as to price differences in retail stores; by Schultz, R. Schickele, L. G. Allbaugh, W. W. Wilcox, and Hopkins as to average acreages of soil-depleting and soil-conserving crops and permanent pasture, and number of different kinds of livestock in 1933 on over 300 heavy grain, heavy grass, and average farms; by F. Robotka and P. E. Quintus in the study of the organization and membership of Iowa farmers' cooperative creameries; and by Schultz in the study of economic implications to Corn Belt agriculture of certain structural changes in foreign trade and in a study of the changes, 1929–33, in expenditures for different purposes on Iowa farms; and part 2, a chart by G. S. Shepherd showing the acreages and yields of corn, 1866–1935, and the acreages of wheat and hay, 1900–1935, in Iowa; findings by Bentley as to the rail and truck shipments and local sales of feed grains by eight elevators in Hamilton County; by Schultz as to the competitive position of American lard in foreign markets; and by Shepherd as to factors affecting the price of corn.

[Investigations in agricultural economics by the New Mexico Station, 1935–36] (*New Mexico Sta. Rpt. 1936, pp. 13–16*).—Investigations not previously noted are included, with general recommendations based on the study of adjustments in farming desirable to conserve soil and range resources made in cooperation with the U. S. D. A. Bureau of Agricultural Economics and Agricultural Adjustment Administration, and a table showing the relative importance of different sources of income in three pump irrigation sections of the State.

Current Farm Economics, [April 1937] (*Oklahoma Sta., Cur. Farm Econ., 10 (1937), No. 2, p. 25–47, figs. 3*).—Included are articles on Use of Short-Term Credit by Farmers in Selected Oklahoma Counties, by L. S. Ellis (pp. 26–28); Is Farm Tenancy Inherently an Evil? Yes? No? Who Knows? (pp. 29–34) and The Livestock Situation (pp. 41, 42), both by P. Nelson; The Development of Credit Unions in Oklahoma (pp. 34–39) and General Situation (pp. 42–47), both by T. R. Hedges; and Some Results of Marketing Oklahoma Wool on Grade, by A. W. Jacob (pp. 39–41).

The importance of farm accountancy for the study of certain economic problems in agriculture, J. Deslarzes (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 26 (1935), Nos. 2, pp. 41–54; 3, pp. 107–117*).—Some examples are given of the contributions that may be made by the results of

farm accountancy in determining gross returns, earning capacity, advantages of different types of farming, etc.

Notes on the use of farm accountancy data in comparative economic inquiries, G. Pavlovsky ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *26* (*1935*), *No. 5, pp. 169–175*).—The possible use of farm accountancy data is studied, and different types are discussed.

"Farm accountancy data, either obtained by the method of sampling or resulting from the monographic study of a small group of farms, cannot be used as the only source of material in agricultural economic research. Used as supplementary material they enrich the equipment of the student considerably by enabling him to gain insight into such aspects of the problems dealt with which would not be gleaned from any other sources."

Some observations concerning farm accountancy methods in the United States, J. Deslarzes ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *27* (*1936*), *No. 2, pp. 50–60*).—This article embodies the results of a study from a methodological point of view of the accountancy results of the farms of Illinois, Iowa, and Indiana in 1932.

Costs and prices: Some factors of the evolution of mechanical power in farming, C. Kappstein ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *26* (*1935*), *No. 8, pp. 298–314*).—A study is made of the relation of prices of coal, gasoline, electric current, etc., on the prices of agricultural products and the effect on the use of mechanical power in agriculture in Great Britain, Germany, the United States, and Italy.

Cost of production of beets, carrots, cauliflower, celery, cucumbers, eggplant, lettuce, okra, peppers, radishes, spinach, squashes, and turnips, compiled by H. W. Hawthorne (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp.* [*2*]+*58*).—Data for the years 1914–34 drawn directly or computed from Federal publications and those of State experiment stations and other agencies are presented.

A farm management study of 224 coffee farms in Puerto Rico, 1934, J. M. García (*Jour. Agr. Univ. Puerto Rico* [*Col. Sta.*], *21* (*1937*), *No. 1, pp. 29–67, figs. 2*).—This is the complete report on the study previously noted (E. S. R., 76, p. 412). An analysis is made of survey records from 224 coffee farms in 19 municipalities.

The average size of farms was 186 cuerdas (181 acres), of which 88.5 cuerdas were in coffee. Forty-two percent of the coffee bushes were under bearing age. The average investment was $15,580 per farm, of which 83.4 percent was in land. The average labor income was —$1,120, and only 9 percent of the farmers had a positive income, averaging $414. Labor income was indirectly related to all measures of size of business and directly to measures of efficiency of operation. Owner-operated farms showed less loss than those operated through major-domos or salaried managers.

The financing of the growing and marketing of cotton, G. Costanzo [(*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *27* (*1936*), *No. 1, pp. 1–39*).—This article describes the systems of financing in the United States, India, Egypt, Union of Soviet Socialist Republics, China, Argentina, Brazil, Turkey, and other countries.

Cultivation of cotton in Spain, E. Martínez de Bujanda ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *27* (*1936*), *No. 2, pp. 60–66*).—The governmental measures for promoting cotton growing in Spain are briefly described.

Distribution of farms growing sugar cane by type of management and [illegible] (*Puerto Rico Col. Sta. Mimeogr. Rpt. 3*

[1937], pp. 4).—This report is based on a special tabulation showing the number and area of farms, area planted to sugarcane, and estimated production.

Organization and returns of 130 sugar cane farms in Puerto Rico, S. L. Descartes and J. M. García (*Puerto Rico Col. Sta. Mimeogr. Rpt. 4* [*1937*], *pp. 6*).—Tables show the size of farms, use of land, distribution of capital, areas in different crops, crop yields, farm receipts, cash expenses, and labor income after allowing for interest on investment.

A farm management study of 194 small tobacco farms in three municipalities of Puerto Rico, 1935–1936, J. J. Serrallés, Jr., R. C. Olón Torres, and F. J. Juliá (*Puerto Rico Col. Sta. Mimeogr. Rpt. 5* [*1937*], *pp. 8*).—Tables show average size of farms, use of land, distribution of capital, crops grown, crop yields and sales, value of livestock, receipts, expenses, and labor income, including value of privileges less interest on investment.

The importance of pig breeding for the profit capacity of agriculture in certain countries of Europe from 1927–28 to 1931–32, J. Deslarzes ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *26* (*1935*), *Nos. 8, pp. 285–297; 9, pp. 317–330; 12, pp. 421–429*).—The development of pig breeding in Denmark, the Netherlands (Overijssel), Switzerland, Austria, Germany, Norway, Sweden, Finland, Poland, Lithuania, Latvia, and Estonia, and the effects on returns from agriculture are discussed.

Comparative studies of the results of pig breeding in different countries, J. Deslarzes ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *26* (*1935*), *No. 5, pp. 175–184*).—The purpose of this article is to "investigate in the light of farm accountancy results the comparative advantages of different regions of the world in the matter of pig and pig meat production."

Pig breeding as a factor in the earning capacity of agriculture in different countries on the eve of the crisis, J. Deslarzes ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *26* (*1935*), *No. 7, pp. 241–252*).—Comparisons based on the article noted above are made of the returns from pig breeding and other farm enterprises in the different countries.

Meat imports and the livestock industry in the United Kingdom, C. Hubback and J. K. Montgomery ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *26* (*1935*), *Nos. 10, pp. 353–360; 11, pp. 389–402*).—The imports of meat from the British Dominions and foreign countries under the free trade policy prior to 1932 and the Ottawa and other agreements since 1932, the prices of meats, etc., are analyzed and discussed.

Production and consumption of and external trade in meat in France, P. de Viguerie ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *27* (*1936*), *Nos. 8, pp. 235–256; 9, pp. 275–293*).—The production of livestock and meats before and after the war, the consumption, exports, and imports of livestock and meats, the regulation of imports, etc., are discussed.

Development of the production, importation, and consumption of meat in Germany, H. Böker ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *27* (*1936*), *No. 5, pp. 135–156*).—The production of livestock of different kinds, the import duties on meats, the imports and exports of livestock and meats, and the consumption of meats are shown in tables and discussed.

Effect of changes in international price levels on the principal markets for eggs in the shell, 1926–1933, C. Kappstein ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *26* (*1935*), *No. 4, pp. 133–150*).—An analysis is made of the effects of differences and changes in international price levels, 1926–33, on exports and imports of eggs in shell of different countries.

Imports into the principal countries are affected by changes in international price levels, but there are no fixed relations and they vary with different

countries. The prevalence of the clearing system of trade has lost its significance to a marked degree during the last few years.

Milk transportation problems in the St. Louis milkshed, R. W. BARTLETT and W. F. CASKEY (*Illinois Sta. Bul. 430 (1937), pp. 421–470, figs. 23*).—This study is based chiefly on data in the office of the St. Louis milk market administrator and data obtained through field contacts with truckers hauling milk in the St. Louis milkshed. An analysis is made of the production of milk, types and length of hauling routes, costs of transportation, costs of operating milk trucks, etc. Ways of reducing hauling costs and other costs are discussed and recommendations made as to methods of solving some of the transportation problems of the milkshed.

In 1933–34, farmers paid approximately 17 percent of the wholesale value of the milk delivered to St. Louis for transporting it from the farm to receiving plants. About 50 percent of the milk produced for the St. Louis market is hauled directly from farms to city plants in cans. Railroad tank car shipments have not come into use. The average haul on 244 country plant routes was 20.3 miles, that on 99 main line routes 100.1, and that on short line routes, about 10 percent of the routes, 18.1 miles. Transportation rates varied from 5 to 30 ct. per 100 lb. of milk, averaging 17.7 ct. on the 244 country plant routes. Rates were not related to type of road or size of load. Low production per cow and sparse cow population increased the transportation problem materially. Rerouting to eliminate mileage and increasing size of loads would reduce costs. If seasonal fluctuations in milk production could be reduced to those of the Philadelphia milkshed, at least one truck in five could be eliminated. About 20 percent of the milk hauled to St. Louis in 1933–34 was manufactured into butter or other dairy products. Farmers could have saved about 16.3 ct. per 100 lb. on this milk if it had been marketed through country plants. Unnecessary delays in unloading at receiving plants in 1934 resulted in an average daily loss of 196 man and truck hours.

Among the recommendations are: (1) Milk now manufactured in the city should be diverted to country plants, (2) a more even seasonal production of milk should be encouraged by marketing policies, (3) hauling routes should be gradually rearranged to reduce distance and increase size of load, (4) schedules of truck arrivals at receiving stations should be revised to prevent unnecessary unloading delays, (5) a minimum pick-up charge should be established, and (6) complete records of costs of operating milk trucks should be kept by truckers.

The reorganisation of dairies in Latvia, V. KUNKIS ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *27 (1936), No. 3, pp. 91–101*).—The development of cooperative dairies and governmental regulation of dairies since the war and their effects on the industry are described.

The international organisation of the sugar market, F. ARCOLEO ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *27 (1936), No. 6, pp. 171–186*).—The international regulation of the sugar market from the signing of the Paris Convention in 1864 to the termination of the Chadbourne Agreement, September 1, 1935, is discussed.

The economic aspect of the world problem of the production and consumption of coffee, E. MARTINEZ DE BUJANDA ([*Internatl. Rev. Agr.*], *Mo. Bul. Agr. Econ. and Sociol.* [*Roma*], *27 (1936), Nos. 6, pp. 186–197; 7, pp. 216–232*).—The production, consumption, and regulation of production in different countries are discussed. The author concludes that the great increase in the area in coffee and the resulting surpluses of coffee were due to the high prices up to 1929 resulting from the valorization artificially maintained by Brazil. The

later policy of destroying surpluses brought about equilibrium on the market and reasonable prices but cannot be continued indefinitely. "The solution probably lies in concentrating production on the better qualities."

The organisation of the international timber market, F. Arcoleo (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 27 (1936), No. 2, pp. 41–49*).—The problems investigated and conclusions arrived at by the international forestry, silviculture, and timber congresses from 1900 to 1931 are briefly reviewed. The agreements made at the Conference of Timber Exporters at Berlin December 1933, Wien (Vienna) October 1934, and Köbenhaven (Copenhagen) November 15, 1935, are described.

International organisation of the rubber market, F. Arcoleo (*Internatl. Rev. Agr. [Roma], 27 (1936), No. 11, pp. 339–356*).—The position of the market previous to 1921, the first (May 1922) and second (October 1922) reports of the Stevenson committee and the Duncan report (1921) to the British Parliament, and the international agreement of 1934 are discussed.

Costs and prices: The evolution of the market for commercial fertilizers, C. Kappstein (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 26 (1935), Nos. 1, pp. 1–16, fig. 1; 2, pp. 55–76*).—Particular attention is given to acreages in cotton in the United States and in sugar beets in Europe, especially in Germany, and the resulting demand for nitrogenous fertilizers since the World War and the conditions, from 1928–29 to 1933–34, affecting the use of nitrogenous, phosphoric, and potassic fertilizers in Germany, Denmark, France, Great Britain, Italy, the Netherlands, Poland, Sweden, and Czechoslovakia.

The prices and consumption of commercial fertilizers, particularly nitrogenous fertilizers, were especially influenced by acreages in and prices of cotton and sugar beets. No determinable influence was exercised by wheat. Since the World War the nitrogen market has been ruled by synthetic nitrogen, especially by the German Haber-Bosch manufacture. Sulfate of ammonia, as a byproduct of gas and coke factories, has lost much of its importance, although it is almost the sole important nitrogenous fertilizer in the United States and Great Britain since the decrease in the consumption of nitrate of soda. Government intervention on the cereal market in various countries has had the effect in such countries of maintaining satisfactory price relations between the products and means of production, or of establishing new relations.

A graphic presentation of changes in the agriculture of Washington from 1930 to 1935, C. P. Heisig (*Washington Sta. Bul. 341 (1936), pp. 47, figs. 42*).—Charts and maps show by counties the changes from 1930 to 1935 in the number and size of farms; farm population; value of farm real estate; land utilization; acreages in different crops, fruits, and vegetables; numbers of livestock of different kinds; egg production; etc.

Willamette Valley land adaptability, H. E. Selby and L. Fryer (*Oregon Sta. Circ. 120 (1937), pp. 4, pl. 1*).—This study was made in cooperation with the U. S. D. A. Bureau of Agricultural Economics and the Resettlement Administration. The lands of the valley are classified in four valley and two hill types. The characteristics and optimum uses are briefly described for each type.

Information for prospective settlers in Alaska (*Alaska Stas. Circ. 1, rev. (1937), pp. 36, figs. 19, map 1*).—This is a revision of the circular previously noted (E. S. R., 36, p. 791). It includes information as to climate, agricultural areas, schools and churches, national forests, judicial divisions, taxation, cost of living, opportunities for work and wages, transportation and communication facilities, agricultural research and extension work, freight rates, wildlife,

fisheries, reindeer production, and where settlers should locate and how they may obtain a farm.

Foreign Agriculture, [March 1937] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 1 (1937), No. 3, pp. 101–154, pls. 2*).—Included are articles on German Agriculture in the Four-Year Plan, by L. V. Steere (pp. 103–118), Agriculture in Palestine and the Development of Jewish Colonization, by N. W. Hazen (pp. 119–148), and Argentine Beef Subsidy—Partial Compensation for British Tariff, by P. O. Nyhus (pp. 149–151); and notes on Brazilian State [Rio Grande de Norte] Adopts Sweeping Cotton Regulations (pp. 152, 153) and Argentina Makes Plans for New Agricultural Census (pp. 153, 154).

Agricultural policy and the crisis in Poland, A. Jalowiecki (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 26 (1935), Nos. 4, pp. 150–161; 5, pp. 185–193*).—The place of agriculture in the country, agricultural production, internal consumption of agricultural products, the economic conditions of the industry, the measures taken in regard to agricultural prices, lowering production costs, and the effect of such measures are discussed.

The development of the agrarian reform in Spain, E. Martinez de Bujanda (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 26 (1935), No. 7, pp. 252–263*).—The effects of the law on the confiscation of the property of the nobles (August 25, 1932) and other legislation thereafter are described.

The new regulation of the wheat market in Spain, E. Martinez de Bujanda (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 26 (1935), No. 12, pp. 429–439*).—The regulations since July 1, 1934, are outlined and their effects explained.

The wheat policy of France since 1929, H. Böker (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 26 (1935), No. 3, pp. 97–108*).—The legislation and regulations in effect from December 1, 1929, to December 24, 1934, are discussed.

Agricultural protectionism and the agricultural situation, 1925–1929, I, II, A. Emanuel (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 27 (1936), Nos. 3, pp. 75–91; 4, pp. 107–122; 5, pp. 157–168*).—The origins and evolution of protection from 1925 to 1929 in France, Germany, and Italy; the basic changes in agricultural production and in the consumption of agricultural products; price movements in European countries and in the United States; and the international trade in agricultural products are discussed.

Farm tenure in Iowa.—II, Facts on the farm tenure situation, R. Schickele (*Iowa Sta. Bul. 356 (1937), pp. 241–296, figs. 26*).—This is the second bulletin of the series previously noted (E. S. R., 76, p. 864). It is a graphic and statistical summary of the more important facts pertaining to farm tenure in the State. The text calls attention to the major relationships suggested, but no attempt has been made to interpret them.

Law on agricultural settlement in Chile, E. Martinez de Bujanda (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 26 (1935), No. 9, pp. 340–347*).—The economic geography of the country is described, and the provisions of the agricultural settlement law of February 15, 1935, are reviewed.

Farm labor in the Yakima Valley, Washington, P. H. Landis and M. S. Brooks (*Washington Sta. Bul. 343 (1936), pp. 75, figs. 29*).—This study was made in cooperation with the Federal and State Works Progress Administrations and the State Department of Public Welfare. It is based on farm schedules and workers' record cards for the period July 28, 1935–July 25, 1936, for farms in two sections of each township in the irrigated area of Yakima County and on data as to family composition, age, nativity, marital status, education, mobility and occupational history, and the relief records of 468 white farm

laborers. The first part analyzes data as to seasonal employment of hired, family and exchange, and transient and resident hired labor for fruit and general crops, and hired labor for harvesting crops. Estimates are made of hired labor requirements in the Yakima Valley by weeks. Part 2 analyzes the data as to social characteristics, annual employment, income and relief experience of the laborers, and the relation of age, education, mobility, etc., to income and relief payments. Copies of the schedules and record cards are included.

The average amount of hired labor was 12 days per acre for fruit crops and approximately 2 days for general crops. The average costs per acre were fruit crops $30, ranging from $14.87 for prunes to $37.04 for apples; general crops approximately $4.50, ranging from $1.44 for barley to $13.61 for beets; and hops $50 for cultivation and $163 for harvesting. The total hired labor in 1935 was equivalent to over 1,250,000 10-hr. days. The number of hired laborers required varied from approximately 33,000 in the peak period to less than 500 in the slack period. The greatest demand was in September due to hop picking and the second highest in October due to apple picking. Wages varied from $1.25 per day in the hop harvest to $2.51 for apple picking. Slightly more than twice as much resident labor as transient labor was hired, transient laborers being needed chiefly for hop and apple picking.

Of the transient laborers, 38.1 percent were from Washington outside of Yakima County, 23 percent from drought-stricken States, and 18.7 percent from Oregon and California. Over 50 percent had no families, about 33 percent brought families with them, and 10 percent had families elsewhere. Transient laborers had smaller families and a smaller percentage of aged than resident families. Heads of transient families also had gone farther in school, but their children had not gone so far as residents though farther than their own parents. The farm laborers, both resident and transient, participated only to a very limited extent in community activities. As compared with the rural population of the State, an abnormally large percentage of white laborers was native-born. Housing and sanitary conditions of all laborers, and especially transients, were poor. Approximately 50 percent of the transients moved only twice a year and 28 percent only three times. Over two-thirds of the farm jobs of farm laborers lasted 1 week or less. Slightly over 75 percent of all laborers had 1 mo. of steady employment during the year, and the average total employment during the year was approximately 6 mo. Of the laborers, 47.6 percent were usually engaged in agriculture as laborers or operators. The median cash incomes were transient families $350, resident families $275, transient single workers $335, and resident single workers $215. About 20 percent of the transient single workers and 43 percent of the transient families had been on relief the preceding year. The percentage of families on relief was lowest among those having the most education. There was a low positive correlation between amount of education and income, no definite correlation between number of days employed and age, and a high positive correlation between the amount of employment and annual income.

National statistics on farmers' indebtedness: The United States census and a new Swedish inquiry, R. Freund (*Internatl. Rev. Agr.* [*Roma*], *27* (*1936*), *No. 10, pp. 311–331*).—This contribution to the problem of international statistics of agricultural indebtedness is based on a study of the reports of the 1930 Census of Agriculture and the Swedish survey of indebtedness in 1933. The data available from these general surveys are compared with each other and with those obtained by surveys made by the sample method. The methodological principles used in the surveys and the utilization and presentation of the data are discussed.

The following requirements for the elaboration and presentation of general survey data of agricultural indebtedness are formulated: "(1) For the calculation of debt ratios (debts divided by assets) the whole of the farms under review, or rather of the data supplied by these, should always be utilized; if, for example, the nonindebted farms are left out the results are no longer comparable with those of other surveys, even if those too leave out of count the nonindebted farms; (2) on the other hand, full particulars must be given for at least the debt-free farms and for those that are excessively indebted; it would also be desirable to extend this principle to all the groups of indebtedness, i. e., to establish a schematic representation of the spread of the debt ratios; [and] (3) for the tabulation and representation of the data according to size categories of farms, the basis chosen should be not that of area but that of value of land, as it is only in this way that the survey retains its definite character."

A graphic summary of farm taxation, D. JACKSON (*U. S. Dept. Agr., Misc. Pub. 262 (1937), pp. [2]+17, figs. 24*).—This publication is one of the series previously noted (E. S. R., 77, p. 117).

The retail sales tax, W. P. WALKER and E. C. WEITZELL (*Maryland Sta. Spec. Bul. 1 (1936), pp. 27, pl. 1*).—Retail sales taxes are discussed, with particular reference to administrative problems of their collection.

The assessment and collection of motor vehicle property taxes in Maryland, W. P. WALKER (*Maryland Sta. Spec. Bul. 2 (1936), pp. [3]+27*).—This study was made in cooperation with the Maryland State Planning Commission. The existing laws regarding the assessment and collection of motor vehicle property taxes in Maryland are described and the operation and effects discussed. Several suggested plans for improvement of legislation and administration are outlined.

[Hail insurance], F. ARCOLEO (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 26 (1935), Nos. 4, pp. 161–167; 6, pp. 226–234; 7, pp. 273–282; 10, pp. 369–385; 12, pp. 439–448; 27 (1936), No. 8, pp. 256–270*).—The series of articles previously noted (E. S. R., 73, p. 119) is continued for the following countries: Yugoslavia (pp. 161–167), Germany (pp. 226–234, 273–282), France (pp. 369–385), Spain (pp. 439–448), and Italy (pp. 256–270).

Insurance against live stock losses in France, F. ARCOLEO (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 26 (1935), No. 5, pp. 193–201*).—The legislation pertaining to mutual insurance associations is reviewed. Tables show the date of foundation, headquarters, assets, extent of business, claims paid, etc., in 1933, and the assets, number of persons insured, value of stock insured, and claims paid by years, 1888–1933.

[Agricultural cooperation] (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 26 (1935), Nos. 1, pp. 16–39; 2, pp. 77–92; 3, pp. 117–128; 6, pp. 205–226; 7, pp. 263–273; 9, pp. 330–339; 10, pp. 360–369; 11, pp. 402–417*).—The following articles continue the series previously noted (E. S. R., 73, p. 118): Austria, by M. Tcherkinsky (pp. 16–39, 77–92, 117–128); Italy, by G. Costanzo (pp. 205–219); Yugoslavia, by G. Severin (pp. 219–226, 263–273); and Sweden, by H. Lindstedt (pp. 330–339, 360–369, 402–417).

Crops and Markets, [March 1937] (*U. S. Dept. Agr., Crops and Markets, 14 (1937), No. 3, pp. 49–68, fig. 1*).—Included are the usual crop and livestock production and market reports and seasonal reports on acreage intentions for important crops, early spring lamb crop, and mohair and wool production.

Agricultural statistics for Maryland by counties, A. B. HAMILTON (*Maryland Sta. Spec. Bul. 3 (1936), pp. [52]*).—This is a compilation from the 1935 Federal census reports and reports of the U. S. Department of Agriculture.

RURAL SOCIOLOGY

Introduction to rural sociology, C. R. Hoffer (*New York: Farrar & Rinehart, 1934, rev. ed., pp. XIV+500*).—A revised and enlarged edition (E. S. R., 64, p. 280).

Six for one and one for six (*New England Region. Planning Comn. Pub. No. 48 (1937), pp. [3]+54, [figs. 13]*).—"The purpose of this report is to outline the accomplishments and recommendations of the several State planning boards and of the New England Regional Planning Commission."

An approach to county planning, Appanoose County, [Iowa] [*Ames*]: *Iowa State Planning Bd., 1936, pp. [10]+IX+109+[2], [pls. 77]*).—"This study of Appanoose County represents an attempted appraisal of the physical and social resources of an Iowa county in the light of present maladjustments or problems. It has been compiled from various sources, and much of it is the result of original investigations and compilations by members of the Iowa State Planning Board staff. A great deal of the material herein set forth is of a sort basic to planning in any Iowa county." The two parts deal with the physical characteristics, population and employment, agriculture and industry, electrification and communication, public water supply, and transportation of the county as a whole; and the population trends, social organizations, income and employment, housing, urban land use, residential, commercial, and industrial areas, streets, and recreational facilities of cities and towns.

[Research under WPA in Virginia] (*W. P. A. Rec. Va., 1 (1937), No. 4, pp. [2]+20, figs. 21*).—Included in this periodical are the following articles: WPA Real Property Surveys Pave Way for Greater Cities, and Research Under WPA in Virginia Covers Wide Field, both by W. W. Eure; Vital Accident Statistics Rendered by WPA Traffic Surveys, by M. M. Holloway; Public Agencies to Profit by Fundamentals Governing WPA Statistical Projects, by A. W. Moore; and Rural Social Research at V. P. I. in Cooperation with WPA, by B. L. Hummel.

Southern regions of the United States, H. W. Odum (*Chapel Hill: Univ. N. C. Press, 1936, pp. [XIV]+664, [figs. 303]*).—The objective was to present an adequate picture, partial but representative, of the southern regions of the United States in fair perspective to time-quality to geographic factors, and to the cultural equipment and behavior of the people.

Racial factors and economic forces in land tenure in the South, M. N. Work (*Social Forces, 15 (1936), No. 2, pp. 205-215, figs. 2*).—This study is based on Federal census data for the years 1860–1930 regarding whites and Negroes in the States south of the Potomac and Ohio Rivers and west to Texas (excluding Oklahoma). An analysis is made of the intercounty migration; distribution, total and of farm operators; density of population; population centers, total and of farm operators; and of the racial factors in land ownership and tenancy in this area.

Landlord and tenant on the cotton plantation, T. J. Woofter, Jr. (*Works Prog. Admin. [U. S.], Div. Social Res., Res. Monog. 5 (1936), pp. [5]+XXXIII+288, figs. [43]*).—Large-scale cash-crop farming continues today in the areas of the Southeast that had large slaveholdings and large cotton plantations in 1860. The Negro or white tenant farmer operates most of the plantation land. The land is adaptable to large-scale cotton production. There is a high degree of concentration of land ownership, with a consequent high proportion of tenants among the farm operators. Such areas are characterized by per capita incomes higher than those in other southern agricultural counties but lower than those in other farming sections of the Nation; small proportions

of urban and village dwellers; scarcity of nonagricultural industries; large families; poor school facilities, especially for Negroes; and a highly mobile population.

The number and proportion of large holdings in the South have decreased. The disintegration of large tracts was steady from the Civil War to about 1910, but at present there is a tendency to hold large tracts together.

Concentration on cotton increased from the Civil War until the bollweevil invasion soon after 1910. Since 1910 there has been a marked shift of the cotton acreage to the States of Texas and Oklahoma, the combined acreage in these States having increased 100 percent from 1910 to 1930, when half the cotton acreage of the United States was concentrated in those two States. Alabama, Georgia, North Carolina, and South Carolina had 5 percent less acreage in cotton in 1930 than in 1910.

Up to the inauguration of the cotton reduction program, the plantations of the South tended to be less and less self-supporting. Between 1933 and 1935 probably more crop diversification was undertaken than during any other period of the South's history. Although exclusive cotton culture results in heavy losses in bad years, the owners of large tracts still concentrate on this crop because no other use of large-scale tracts is so profitable to the landlord in good years.

Nearly half of the landlords interviewed for this study had long-term debts, mostly in the form of mortgages, averaging more than 40 percent of the appraised value of their land, buildings, animals, and machinery. These long-term debts were incurred to meet deficits or purchases of machinery, etc.

The long-term debts of tenants are usually contracted with or through the landlord and are either secured by chattel mortgage on livestock or equipment or simply carried forward on the landlord's books and added to current borrowing as a lien against future production. The tenant's short-term debts for the current season are usually incurred with the landlord, who provides the tenant's share of expenses and his subsistence advances during the crop season, charging them against future production. Sometimes the merchant makes the subsistence advances. The average time for which advances were made, as shown by this survey, was 7 mo., and the average advance was $12.80 per family per month.

In 1934 the average net income per plantation was $6,024. With A. A. A. benefits included, 1934 incomes compared favorably with those for 1929. On the average, the larger the plantation, the higher the gross and the net income. The average net income of the operators was $2,572, about 10 percent of which was in the form of home-consumed products. The net income ranged from an average of $1,340 in the Muscle Shoals area to $7,149 in the Arkansas River area.

The landlord's net income in 1934 was sufficient to pay him 6 percent on his invested capital and about $850 for his labor income. The average net income per family of the wage hands, croppers, share tenants, and renters on plantations in the 11 areas surveyed was only $309, or $73 per capita.

The average number of years lived on each farm by white plantation families in this study was 4.8 yr. and by Negro families 6.1 yr. White sharecroppers lived on each farm for an average of 4.4 yr. and Negro sharecroppers for 5.6 yr.

Southern States tax themselves for schools as much per dollar of wealth as do other sections, but the wealth is so inadequate that the resulting revenue provides a very small appropriation per child.

Displacement of tenants during the early years of the depression was an important factor in the rural relief situation. Relief grants and rehabilitation loans were necessary where the "furnishing" system ceased to operate, but these grants and loans were relatively few and of small size among plantation families and more frequent among families on smaller farming units.

Constructive efforts to improve the tenant system must take into account certain basic conditions in the South, especially those relating to the quantity and quality of the population, the interregional and international aspects of cotton economy, the type of farm organization to be promoted, and the slowness of fundamental social change.

Studies of suburbanization in Connecticut.—I, Windsor: A highly developed agricultural area, N. L. Whetten and E. C. Devereux, Jr. (*[Connecticut] Storrs Sta. Bul. 212 (1936), pp. 144, figs. 26*).—This report is a descriptive analysis of the social adjustments taking place in a suburban area of Connecticut. It is the first in a series of studies of suburbanization and concerns the town of Windsor, situated adjacent to the city of Hartford.

Suburbanization in Windsor has been proceeding rapidly since the turn of the century. The population has more than doubled since 1910, and more than one-third of the families in the town have moved there since 1920. The movement has continued throughout the depression. At the present time, approximately half of the householders in Windsor work in Hartford, as do about 40 percent of all other gainfully employed persons. The suburban movement in this area appears to be predominantly one of "white-collar" and skilled workers seeking a country setting in which to rear their children and secure the traditional values of home life. The home-seeking pattern of the suburban movement is also reflected in the trends towards more adequate housing facilities. There was a net shift from rented to owned homes, from multiple-family dwellings to single-family residences, and from crowded conditions to a greater number of rooms per member in the household.

As reflected in the places patronized for various social and economic services and the places where organizational memberships are held, it appears that the interests of the newcomers are largely focused upon the city. The point of view of the suburbanites differs from that of the older residents, the latter being primarily interested in preserving the quiet charm of the old New England town, the former being more interested in developing Windsor into a modern suburb.

Old age assistance in Iowa, R. E. Wakeley (*Iowa Sta. Rpt. 1936, pt. 1, pp. 185, 186*).—Data as to old age dependency are noted.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Home economics education courses (*U. S. Dept. Int., Off. Ed., Vocat. Ed. Bul. 187 (1936); pp. VII+101, figs. 2*).—This study of practices in teacher training institutions reimbursed from Federal funds for vocational education included 72 institutions in 1931 and 71 in 1935. A check list of 76 topics usually included in home economics education courses was prepared and sent to teacher trainers, State supervisors, and 1928, 1929, and 1930 graduates of the institutions who had obtained teaching positions in home economics. Two hundred returns from the first two groups represented 46 States, 68 teacher training institutions, and 47 of the 61 State supervisors and assistant supervisors. Four hundred and thirty-seven returns were received from the alumnae. The curriculum offerings in the different institutions, size of student teaching groups, facilities, standards, distribution of time to the student teaching ac-

tivities, extent of supervision of student teaching, the evaluations of topics included in courses, and the criticisms of the alumnae of the programs in their respective institutions are analyzed and conclusions and recommendations presented.

A study of the results of planning for home economics education in the Southern States as organized under the national acts for vocational education, D. C. KENT (*Columbia Univ., Teachers Col., Contrib. Ed., No. 689 (1936), pp. IX+172, figs. 21*).—This study is limited to home economics education as organized under the national acts for vocational education. Homemaking education in the white public schools of the South prior to 1918 is described. Plans for the organization and administration of home economics education in the vocational program in the southern region from 1917 to 1933 and reports of the development of home economics in vocational schools in the southern region from 1918 to 1933 are discussed. A final chapter includes a summary of the findings, the conclusions arrived at, and the recommendations made. Appendixes include a summary of reports and recommendations of committees in the Southern Regional Conferences for Home Economics in Vocational Schools, 1921–32; a summary of State conferences as described in annual reports; the personnel of State supervisory staffs in the southern region, 1917–33; and a summary of expenditures of Federal, State, and local funds for home economics in vocational schools and the number of home economics schools federally aided, by States for years ended June 30, 1918, to June 30, 1932.

4–H club work in the life of rural youth, M. E. DUTHIE (*Thesis, Univ. Wis., [Madison], pp. [9]+124, figs. 10*).—This is a thesis submitted to the University of Wisconsin in partial fulfillment for the degree of doctor of philosophy. The study was confined to Rock and Dodge Counties, Wis., Kossuth County, Iowa, and Goodhue County, Minn. Schedules were filled in by 235 4–H club members, and local 4–H club leaders and 135 former club members and 68 nonclub members from 18 to 25 yr. of age were interviewed. Data regarding rural school children from the seventh to the tenth grades were obtained in 2,619 intelligence tests, 2,372 attitude tests, and 2,619 schedules answered by the children. Notes on the methodology and copies of the schedule used are included.

Some of the findings were that education of parents had some selective effect on 4–H membership, but it is probably becoming less important; participation of parents in community organizations had some selective effect, but it was greater upon continuation of 4–H membership than on initial enrollment; integration of the family had some selective effect; the average number of brothers and sisters was 3.67 for club members and 4.12 for nonclub members; size of farm had no relation to membership and that of tenancy varied in different counties; the greater part of the 4–H club membership was in the 90–110 I. Q. groups, and the greatest selection of 4–H clubs was in the elimination of dull and superior girls and superior boys; 4–H clubs held a more important place, in point of membership, in the life of rural adolescent than any other organization, and 4–H club members were more active in other organizations than nonmembers; and the emotional satisfaction derived from membership was a significant contribution to 4–H members.

The limited data did not show that former 4–H club members have any larger income than nonmembers, but it did appear that they had more definite arrangements with parents concerning a share of the farm income. Former 4–H members showed more social participation and activity in community affairs. The more important values placed on club work by former members were: (1) "Learning to work with others", (2) "making new friends", and (3) "learning agriculture and home economics." Club members, especially

girls, had a more favorable attitude toward helping with home tasks than nonmembers. A number of questions raised in the study as to varying effects of club work on boys and girls of different ages and intelligence, type of projects, club leadership, etc., are outlined.

Marketing poultry products, E. W. BENJAMIN and H. C. PIERCE (*New York: John Wiley & Sons; London: Chapman & Hall, 1937, 3. ed.,* [*rev. and enl.*], *pp. XI+401, pls. 2, figs. 212*).—This is the third edition, revised and amplified, of the text previously noted (E. S. R., 53, p. 397).

Conservation and rural life: An outline for study, A. M. BOYNTON and E. L. KIRKPATRICK ([*Madison, Wis.*]: *Amer. Country Life Assoc., Youth Sect., 1936, pp. 29*).—This outline for study is adapted to classroom purposes, other small discussion groups, and county, State, and regional conferences.

FOODS—HUMAN NUTRITION

[Studies in foods and nutrition of the Iowa Station] (*Iowa Sta. Rpt. 1936, pt. 1, pp. 77–80, 114, 115, 148–152, 153, 154*).—The work covered by these progress reports (E. S. R., 75, p. 130) includes an extension of studies by V. E. Nelson, P. M. Nelson, and B. Lowe on the effect of different fats on the destruction of vitamin A in foods, with data on the protective effect of various alleged antioxidants against this destruction (pp. 114, 115); a continuation of studies by P. M. Nelson, Lowe, and J. H. Buchanan on the relationships of the physical and chemical characteristics and constants of lard to its culinary value, with particular reference to methods of determining the plasticity of shortening agents (pp. 152, 153); new work by Lowe on methods of roasting frozen poultry for palatability tests (pp. 153, 154); a continuation of investigations by P. M. Nelson and P. P. Swanson on the causes of failure of reproduction and lactation in rats receiving dried canned pork muscle as the chief source of protein at a 15-percent level, with a study of the characteristics of the protective factor in liver, and on conditions influencing the production of uniform experimental animals in the stock colony, with data relative to the normality and uniformity of their colony and observations on dental abnormalities (pp. 148–151); a continuation of an investigation by Swanson and E. S. Haber of the association of vitamin A with plant pigments with a comparison of the vitamin A content of yellow, white (albino), and green corn seedlings (pp. 151, 152); a continuation of vitamin D studies by L. Yoder, including a comparison of the relative lengths of time required for rations unsupplemented and supplemented by vitamin D to pass through the intestinal tracts of rats and the production of antirachitic substances from various sterols (pp. 77, 78); and the completion of fluorine studies by J. A. Schulz, with a summary of the complete investigation (pp. 78–80).

New formulas for predicting basal metabolic rate from pulse rate and pulse pressure, J. M. READ and C. W. BARNETT (*Arch. Int. Med., 57 (1936), No. 3, pp. 521–532, figs. 2*).—A new method is reported for the derivation of formulas for predicting the basal metabolic rate from the pulse rate and pulse pressure. From the equation, Calories per square meter per hour = K (constant) × pulse rate × pulse pressure, the formulas for men and women were obtained. A table is given for use in predicting formulas to calculate the basal metabolic rate directly, allowances being made for sex and age. The accuracy of the new formulas was found to compare favorably with the accuracy of clinical calorimetry. These formulas are valuable for estimating basal metabolic rate if facilities for measuring oxygen consumption are not available and for checking the reliability of the metabolic rate, as determined by direct calorimetry. The test should be repeated when a marked disparity exists between the re-

sults obtained by the two methods. In many cases the metabolic rate predicted by the pulse rate and pulse pressure obtained in the morning before the patient arises may be more accurate than the rate determined by measuring the oxygen consumption after the patient has arisen, dressed, and traveled to the laboratory.

The basal metabolism of young men at Hyderabad (Deccan), with a study of their physical characters, S. A. RAHMAN (*Indian Jour. Med. Res., 24 (1936), No. 1, pp. 173–199*).—The subjects were 32 healthy males averaging 22 yr. of age. Duplicate or triplicate basal metabolic determinations were made, using the Sanborn Motor-Grafic Metabolism Tester. The results show a basal metabolism 5 percent higher than in a study made in Calcutta. The pulse and respiratory rates did not differ from western standards, but the blood pressure was considerably lower and the basal metabolism 6.8 percent below the Harris-Benedict and 8.7 percent below the Aub-Du Bois standards. Physical measurements demonstrated that the weights of the subjects for height and age were below the American standards. Eight vegetarians showed an average basal metabolism about 2 percent lower than the average for the entire group. It is suggested that the humid climate may be a factor in lowering metabolism.

A diet survey of some families and institutions in Calcutta, H. E. C. WILSON, B. AHMAD, and D. N. MULLICK (*Indian Jour. Med. Res., 24 (1936), No. 1, pp. 161–172*).—The study included 10 middle-class Bengali Hindu families, a male hostel, 2 orphanages, an Anglo-Indian school, and 2 subjects representing the poorer classes. All diets analyzed were below western standards in animal protein and fat, calcium, and phosphorus. They contained too low a percentage of dairy products and an excess of cereals. Unfortunately these deficiencies were particularly marked in the children's institutions. Assuming that the western standard cannot be readily applied to India, it would be justifiable to recommend a reduction in the quantity of cereal and increases in the proportion of atta and in the quantity of milk products consumed.

The dietitian and food allergy, C. H. EYERMANN (*Jour. Amer. Dietet. Assoc., 12 (1936), No. 1, pp. 1–10*).—Clinically allergy appears most commonly as bronchial asthma, vasomotor rhinitis, definite types of dermatitis, urticaria, and certain gastro-intestinal disorders and cerebral manifestations. The dietitian's interest is with the clinical manifestations that are due to either the ingestion or inhalation of food substances. The dietetic management is strictly an individual matter and, therefore, ready-made dietary formulas cannot be used. The patient must be instructed to keep a dietetic diary showing not only all foodstuffs eaten and their manner of preparation but also everything else that enters the mouth, such as liquids, medicines, etc., as well as recording the symptoms in relation to the time and place of ingestion. The dietitian should know the various ways of detecting food allergy and be able to prepare a diet within narrow limitations that is nutritionally adequate, yet varied and appetizing.

A study of a dietary cause and possible elimination of early afternoon sluggishness, D. A. LAIRD, D. DELAND, H. DREXEL, and K. RIEMER (*Jour. Amer. Dietet. Assoc., 11 (1936), No. 5, pp. 411–421, figs. 7*).—Eight healthy young men were tested on 24 consecutive weekdays to determine the cause of the first hour afternoon sluggishness among mental workers, the exact degree of lowered mental efficiency involved, and the extent to which this lowering might be prevented. On 12 days the subjects ate a noon meal of generous proportions, and on the other 12 days a lighter but satisfying dairy lunch containing a ready-to-eat cereal with top milk and a gelatin custard, or fresh fruit dessert. One-half hr. after beginning the meal each subject submitted to tests

of mental work and functions such as memory tests, speed and accuracy of mental addition, etc.

Following the dairy lunch there was an increase of approximately 6 percent in mental speed and 25 percent in mental accuracy with lessened brain anemia. In a memory test approximately 23 percent more addresses were remembered after the dairy meal than after the heavy meal. Lapses in attention were about 70 percent fewer and feelings of fatigue about 30 percent fewer after the dairy lunch than after the heavier meal. The acuity of hearing was about 35 percent greater on the dairy meal days. The experiment showed that early afternoon sluggishness is due to a marked degree to brain anemia caused by a heavy noon meal rather than to the necessity of "warming up" which has frequently been offered as an explanation. "A wise selection of light foods for the noon meal can contribute materially toward offsetting lowered mental efficiency during the early afternoon and the consequent low production of mental workers during this part of the work period."

Changes in temperature of the skin following the ingestion of food, G. Booth and J. M. Strang (*Arch. Int. Med., 57 (1936), No. 3, pp. 533–543, figs. 3*).—Observations on the blood pressure and temperature of the skin after a meal composed chiefly of meat and designed to attain satiety were made on 19 persons of normal weight and 14 obese subjects.

In both groups the blood pressure showed the same rise, both systolic and diastolic, at the start of the meal and returned to normal at the completion of the meal. In the group of normal weight subjects the temperature of the skin rose shortly after the start of the meal and continued to rise, the elevation amounting to 0.9° C. in 22 min., when eating stopped. There was a further steady increase to 1.8° in 40 min., and the maximum elevation of 2° was attained in the third 20-min. period. In the obese group the elevation of the temperature of the skin at the time of cessation of eating, 20 min. after the meal was begun, was only 0.1°. After the period of eating there was a further rise to the maximum level of 0.5° in 40 min., and during the remaining 20 min. of observation this level did not change. The elevation of the skin temperature in the obese group was definitely diminished and delayed when compared with that of the group of normal weight subjects.

The authors suggest that this difference in reaction may be one factor in the delayed sensation of satiety in obese persons and, therefore, a controlling factor in the determination of the large intake of obese persons.

The nutritional value of whole wheat and whole rice in regard to the growth, haemoglobin and calcium and inorganic phosphorus of the serum and bone of the albino rat, L. T. Cheng and H. Tao (*Sci. Soc. China, Biol. Lab. Contrib., Zool. Ser., 11 (1935), No. 3, pp. 97–107, fig. 1*).—An investigation is described in which the nutritional values of whole wheat and whole rice in the diet of the abino rat are compared. The diet was composed of baked soybean flour 35 percent, lard 10, cod-liver oil 2, Osborne and Mendel salt mixture 1, sugar 2, and baked whole wheat or whole rice 50 percent, supplemented by green vegetables daily. The experimental period was approximately 14 weeks.

The results show that growth rate, hemoglobin content, and calcium and phosphorus contents of the serum and bone of the rats fed with whole wheat and whole rice, respectively, were approximately equal. This indicates that the nutritional value of whole rice is as good as that of whole wheat. One factor which causes the poor physical development and the deficiency diseases among the rice-eating people of South China is probably the high degree of polishing, which removes most of the vitamin B complex and mineral elements contained in the rice skin.

The use of 3-day periods in human metabolism studies: Calcium and phosphorus, S. I. Pyle and C. E. Huff (*Jour. Nutr., 11 (1936), No. 6, pp. 495–509, figs. 2*).—The study, with the assistance of R. Davis, was made on 10 pregnant women, aged from 22 to 34 yr., using a 3-day balance period with a 24-hr. sampling on the third day, the tests being repeated every 28 days. Food, fecal, urinary, and blood samples were analyzed for calcium and phosphorus. The results of 12 balance studies were selected to match 12 studies of the Macy group (E. S. R., 63, p. 488) and 12 each from the two studies of Coons et al. (E. S. R., 71, p. 880), in which longer sampling periods were used. The four sets of 12 balances were in the same period in pregnancy and were representative of approximately the same number of individuals. The selected balances did not differ significantly enough to indicate that the 3-day period fails to show an individual's metabolic tendencies. The authors feel that this method of studying calcium and phosphorus metabolism during pregnancy should be considered by the clinician.

Variability of metabolic response of different children to a given intake of calcium, H. A. Hunscher, F. C. Hummel, and I. G. Macy (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 1, pp. 189–192, fig. 1*).—The authors report calcium balances for from 24 to 65 consecutive days of six healthy children maintained on simple diets of from 70 to 100 calories per kilogram of body weight per day, appropriate for the age and size of the child and approximately uniform in mineral and nitrogen content, and containing 1 g of calcium per day. The children had served as subjects in previous studies. The four 5-year-old children showed an average total daily retention of calcium, ranging from 0.27 to 0.48 g and varying from 27.4 to 48.5 percent, while the values shown by two 8-year-old children ranged from 0.29 to 0.48 g and varied from 29 to 47.8 percent.

The results show the wide physiological variations present among healthy children of like age and body size and also the increments and decrements that occur in metabolism from time to time in the same individual.

The relation of the calcium content of the diet to the rate of healing of experimental fractures in rats, M. A. Robb (*Jour. Amer. Dietet. Assoc., 11 (1936), No. 5, pp. 422–427*).—A modified Osborne and Mendel normal rat ration, with changes in the salt mixture giving intakes of calcium varying from 0.016 to 0.545 percent and phosphorus from 0.19 to 0.5 percent, was fed to 40 male albino rats. After 35 days on the experimental diet, the left fibula was fractured and, beginning with the sixth day postoperative the animals were X-rayed every third day until healing was completed between the twenty-seventh and forty-fifth days. All the animals on the highest levels of calcium and phosphorus intakes and 12 out of 16 animals on the next two lower levels were completely healed in 27 days. The experiment was repeated on the same animals, replacing the experimental diet with the normal diet following fracture of the other fibula, and the results appear to show that previous diets low in calcium have practically no effect on the rate of healing of fractures in rats. Although there was a tendency for the fractures with a normal diet to heal a little more quickly than those with diets deficient in calcium, the experiments present insufficient evidence to justify an elaborate dietary of patients with fractures.

The question of acid and alkali forming foods, J. A. Tobey (*Amer. Jour. Pub. Health, 26 (1936), No. 11, pp. 1113–1116*).—The author reviews scientific evidence which indicates that the question of acid- and alkali-forming foods is a negligible problem in human dietetics. The ingestion of alkali-forming foods in such amounts as a quart of milk, a quart of orange juice, or a pound

of bananas does not produce even a temporary shift in the H-ion concentration of the blood plasma or in the alkali reserve. The administration of 45 g of sodium bicarbonate is necessary to raise the H-ion concentration of the blood by even 0.2, and from 15 to 20 g of ammonium chloride are required to lower the pH by a similar amount. To accomplish the same results would require 18 lb. of oranges eaten at one time to bring about a shift toward greater alkalinity, and 4½ lb. of lean beef or 2 lb. of oysters would be necessary to produce an effect comparable to that caused by the ingestion of 15 g of ammonium chloride.

The explanation lies in the fact that the human body is a compensatory mechanism that remains stable under different conditions, maintained by the buffer action of the blood, the disposal or carbon dioxide by the lungs, and the action of the kidneys in eliminating excessive quantities of fixed acid or alkali. True acidosis occurs as a rule only in certain severe ailments in which there are disturbances of metabolic processes or organic derangements, as in nephritis and other kidney troubles, diabetes, severe diarrhea, starvation, and acute infections, such as pneumonia and sepsis. "It is obvious, therefore, that foods consumed in the usual quantities will not alter the acid-base balance of the normal person."

Effect of low levels of fluorine intake on bones and teeth, G. Ellis and L. A. Maynard (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 1, pp. 12-16*).—Bone and teeth analyses and observations on pigment changes were made on experimental rats maintained on an adequate diet containing approximately 3 p. p. m. of fluorine and on rats receiving in addition sodium fluoride or bonemeal supplements at levels which increased the fluorine intake by from 8 to 14 p. p. m. Appropriate amounts of calcium oxide and monocalcium phosphate were added to the basal sodium fluoride diets to balance the minerals added by the bonemeal.

The results showed that a marked increase in the fluorine content of the bones after 168 days on the experimental diets was a normal increase occurring with age. Definite pigment changes in the teeth agreed with the bone analyses in showing an effect at the 8-p. p. m. level and greater effects at the higher levels of fluoride intake. Sodium fluoride and bonemeal were equally effective.

Clinical experiences in the use of determinations of blood iodine, E. P. and D. R. McCullagh (*Arch. Int. Med., 57 (1936), No. 6, pp. 1061-1066*).—The following results of blood iodine determinations are reported:

In 10 patients with diseases not related to the thyroid gland, the blood iodine levels averaged 10.2 μg as compared with the normal value of 10 μg per 100 cc of blood. The level was temporarily depressed in a normal patient following violent exercise and reached 6.8 μg within 2 hr. after the exercise. In 10 patients with active hyperthyroidism, the level varied from 11.1 μg to 49.8 μg per 100 cc and in 10 patients with hypothyroidism, the average level was 7.5 μg per 100 cc of blood. In 6 cases of hypometabolism not related to the thyroid gland, 2 showed approximately normal levels and the remainder varied from 6 μg to 11.2 μg per 100 cc. In 6 cases of hypermetabolism in which there was no evidence of thyroid disease, the blood iodine levels varied from 6.1 μg to 10.3 μg per 100 cc.

The use of blood iodine values as a diagnostic aid was demonstrated in 7 cases of thyroid diseases, since under controlled conditions the blood iodine level is in most cases proportionate to thyroid activity, with a greater change in the level resulting in persons with hyperthyroidism than those with hypothyroidism. The administration of iodine raises the blood iodine level.

The selenium problem in relation to public health, M. I. SMITH, K. W. FRANKE, and B. B. WESTFALL (*Pub. Health Rpts.* [*U. S.*], *51* (*1936*), *No. 44, pp. 1496–1505, pl. 1*).—A survey was made of 111 rural families in South Dakota, Wyoming, and Nebraska to determine the possibility of selenium intoxication through the ingestion of locally produced selenium-bearing foodstuffs. The families resided in districts where there appeared to be a high incidence of selenium present in the soil and where cases of "alkali" disease in livestock had been reported. The study was made over a 6-week period from April to June, when home-grown foods were not being consumed generally, and thus the chief dietary constituents that might contain selenium were meats, milk and milk products, eggs, and a relatively limited amount of garden vegetables raised during the preceding year. In addition to information on dietary habits, physical examinations and urinalyses were made on representatives from 90 families.

Although many vague symptoms of ill health were found, none was sufficiently characteristic to be ascribed to the ingestion of selenium exclusively. The results of the urinalyses showed that 92 percent contained from 2 μg to 133 μg of selenium per 100 cc of urine. "This affords definite proof of the absorption of selenium by some of the rural population in the foregoing States. The question as to the effects of selenium, in the quantities ingested, on the health of the population remains an open one."

Experimental staphylococcus food poisoning: A study of the growth of a food poisoning staphylococcus and the production of an enterotoxic substance in bread and meat, F. C. KELLY and G. M. DACK (*Amer. Jour. Pub. Health, 26* (*1936*), *No. 11, pp. 1077–1082*).—Experiments were performed to test the ability of a "food poisoning" strain of staphylococcus to penetrate and grow in the bread of peanut butter, ham, tongue, and chicken sandwiches when introduced into the fillers. In every instance after a few hours of incubation the yellow hemolytic staphylococci were recovered from portions of the bread not in contact with the fillers. Other staphylococci commonly found as contaminants of meat also penetrated into and grew in the bread. The same results were noted with the food poisoning organism when salted meat fillers were used.

Four human subjects were fed either bread or meat in which a food poisoning strain of staphylococcus had been introduced. One subject who ate bread containing millions of the staphylococci developed severe food poisoning symptoms, while the same organism grown in ham caused similar reactions in another subject. When the bread-feeding test was repeated the subject who had previously eaten the contaminated bread was not made ill, while another subject who ate the contaminated bread for the first time developed typical severe food poisoning symptoms. No symptoms were produced when another subject ate the inoculated bread. These results suggest the possibility of an individual resistance to the enterotoxic substance.

The enrichment of margarine with vitamins, I, II [trans. title], S. N. MATZKO (*Ztschr. Untersuch. Lebensmtl., 72* (*1936*), *Nos. 1, pp. 76, 77; 2–3, pp. 143–148, figs. 3*).—Two papers are presented.

I. *Vitamin A and D content of margarine.*—The two margarine samples studied contained sunflower oil, skim milk, small amounts of egg yoke, coloring, and salt, and one sample contained cottonseed oil. The American Pharmacopoeia (1926) method of determining vitamin A was followed, using the Sherman-Burtis ration 379 (E. S. R., 60, p. 194). The results of therapeutic and prophylactic tests showed that when 0.8–1 g daily of the margarine

samples was added as a supplement to the basal diet or administered by pipette no vitamin A effect was observed in the experimental rats.

When 0.4–0.8 g daily of one margarine sample was fed to experimental rats receiving the Sherman-Pappenheimer ration 84 (E. S. R., 60, p. 194), the roentgenogram examinations made at the end of the 3-week period indicated that the margarine did not exert any antirachitic effect.

II. *Enrichment of margarine with vitamin A by means of carotene preparations.*—The carotene extract, which was obtained from dried carrots by extraction with petroleum ether and distillation in vacuum, was thoroughly mixed with the melted margarine and stored for 20 days in a cold dark place. The same experimental procedure for determining vitamin A, as noted above, was followed, and the basal diet was supplemented by 0.1 g daily of margarine, containing 0.05, 0.1, and 0.3 mg, respectively, of the carotene extract.

The experimental rats receiving 0.3 mg daily of the extract showed satisfactory weight gains, with no signs of xerophthalmia. While the animals receiving the 0.05- and 0.1-mg supplements, respectively, were not completely protected, the minimum therapeutic dose was assumed to be between 0.075 and 0.1 mg. One g of the carotene extract was computed to contain 10,000–13,000 international units of vitamin A, which corresponds numerically to 80–100 units in 1 g of the dried carrots, since 1 kg of carrots yielded about 8 g of extract. The tests showed that the method of preparation and the storage of the margarine containing the extract did not alter its vitamin A potency. Good results were also obtained from the use of a carotene extract prepared from dried nettles, the yield being about 4.2 g of extract from 1 kg of nettles.

The strong orange-red color produced in the margarine is due to the large amount of carotene extract necessary and, therefore, the author suggests partial substitution of carotene by a colorless vitamin A preparation such as fish oil.

The vitamin A content of three varieties of squash, M. C. Smith (*Jour. Home Econ., 28 (1936), No. 7, pp. 467–469*).—The Sherman-Munsell quantitative method of assay was followed, with young rats placed on experiment at 21 days of age and given weighed portions of the test food three times weekly during 8 weeks. The vitamin A-free basal ration was composed of starch 66.95 percent, extracted casein 18, Osborne and Mendel salt mixture 4, dried brewers' yeast 10, salt 1, and irradiated cholesterol 0.05 percent. The pulp of the Hubbard variety was readily eaten raw by the rats. The Zucchini and summer varieties, using the proper proportion of skin to pulp, were boiled in a very small amount of salted water until soft and translucent. One week's supply for each rat was prepared and stored in a sealed container in the refrigerator. The variations in weight and the presence or absence of the characteristic infections were taken as criteria of the amount of vitamin A in the test foods.

The results show that daily supplements of at least 0.03 g of raw Hubbard, 0.3 g of cooked Zucchini, and 0.4 g of cooked summer squash were necessary to protect the experimental animals from infection. When the results are interpreted in terms of Sherman vitamin A units, the Hubbard squash (raw) is the richest source of vitamin A and contains 50 units per gram, as compared with 5 units of the dark-green skinned Zucchini or Italian squash (cooked) and 3 units per gram of the light-green skinned summer squash (cooked). Hubbard squash may be considered a very good source of vitamin A, ranking in value with other yellow vegetables and fruits like carrots, yellow sweetpotatoes, fresh apricots, and dried yellow peaches.

The dietetic value of palm oil, T. A. BUCKLEY (*Malayan Agr. Jour., 24 (1936), No. 10, pp. 485–488*).—The vitamin A activity of samples of palm oil, obtained from bunches of fruit in varying degrees of ripeness, was determined by colorimetric and biological methods of assay.

Judging from the growth curves of rats, the following vitamin A potencies of the oils, expressed in international units per gram, were obtained: (1) From underripe fruit 600, (2) from ripe fruit 1,900, (3) from overripe fruit (3.2 percent acidity) 1,600, and (4) from overripe fruit (15.1 percent acidity) 800 units. Colorimetric comparison of the oils with standard carotene gave different results. Expressing both sets of results as milligrams percent of carotene, the four oils should contain, by biological assay, (1) 36, (2) 114, (3) 96, and (4) 48, and by tintometric assay (1) 24, (2) 66, (3) 62, and (4) 60. The results obtained by another investigator were expressed as Carr-Price values in terms of blue Lovibond units per gram as follows: (1) 8, (2) 180, (3) 130, and (4) 135, and standard palm oil 190 blue units per gram.

The results indicate that oil from immature fruit is deficient in vitamin A. The oil as now manufactured, with an acidity of from 3 to 4 percent, appears to be the most satisfactory in dietetic value. Palm oil may be regarded as equal in vitamin A value to good average cod-liver oil, though not equal to the best, and may be recommended for culinary or medicinal use.

Vitamin A in the local treatment of wounds, S. SÁNDOR (*Lancet [London], 1936, II, No. 13, pp. 738–740*).—Case histories are presented to show that the use of pure vitamin A oil or ointment (Vulnovitan) constitutes a real advance in the local treatment of wounds. The wound should be excised, filled with Vulnovitan, and a plaster of paris dressing applied immediately. Vulnovitan is a paraffin oil or an ointment with a vaseline body which contains 2,000 international units of vitamin A per cubic centimeter. Treatment with pure paraffin oil or vaseline failed to show the same tonic and stimulating effect on the healing that was shown by the Vulnovitan application.

The tissue response to subcutaneous injection of cod-liver oil, J. DAVSON (*Lancet [London], 1936, II, No. 13, pp. 737, 738, fig. 1*).—The subcutaneous inoculation of sterile cod- and halibut-liver oils into the shaved ears of adult rabbits produced a marked stimulation of phagocytes, fibroblasts, and young capillaries, thus stimulating the reparative processes involved in the healing of wounds. Liquid paraffin and olive oil were relatively inert. Since the reaction to halibut-liver oil (1 in 20 dilution), which has a vitamin A content at least 100 times greater than cod-liver oil, was less than that due to whole cod-liver oil and only equal to cod-liver oil (1 in 20 dilution), the vitamin A contents of the oils are not responsible for the reaction. "It is possible that the persistent and progressive stimulation produced by cod-liver oil compared with the reaction to olive oil can be explained by the continued hydrolysis of the fats present in the cod-liver oil by tissue enzymes in the former, and by the relative absence of this process in the latter."

Crystalline torulin (as vitamin B_1) and the international vitamin B_1 standard, H. W. KINNERSLEY and R. A. PETERS (*Biochem. Jour., 30 (1936), No. 6, pp. 985–991*).—Following the technic previously described (E. S. R., 70, p. 153), the authors compared the activity of vitamin B_1 in international standard clay with crystalline vitamin B_1. The activity of the vitamin B_1, as determined by the catatorulin test, was: 2γ crystalline vitamin B_1 hydrochloride is approximately equivalent to 1 international unit of Vitamin B_1 (10 mg Jansen clay). A similar value was obtained by the formaldehyde-azo test. Good results were given by the pigeon day dose method for the crude preparation of the vitamin,

but this method did not prove satisfactory for the assay of injected crystalline vitamin B_1. The authors believe that this is probably caused by the presence in the crude preparations of factors which alter the effect of the vitamin B_1. A method is described for the quantitative extraction of the vitamin B_1 activity from acid clay so that the international standard clay extract of full activity may be injected.

Vitamin-C content of vegetables.—II, Peas, G. L. Mack and D. K. Tressler (*Food Res., 1 (1936), No. 3, pp. 231–235*).—In continuation of this series (E. S. R., 76, p. 726), data are given on the relative importance of variety, maturity, size, and freshness on the ascorbic acid content of peas, as determined by the Bessey and King technic (E. S. R., 71, p. 137). The results of the chemical determinations were confirmed by biological assays of two samples, following the modified 14-day curative test as described in the previous study. The peas were grown in clay loam soil during 1935 under a single set of conditions.

Variety was found to be an important factor. Of the 17 varieties tested, the early small-seeded varieties contained more ascorbic acid than the late large-seeded varieties. The values varied from 0.4 mg for the small Mammoth Melting Sugar to 0.19 mg of ascorbic acid per gram for the large Stratagem variety. In 10 varieties the vitamin C content decreased with increasing maturity. For example, Alaska, a common variety of canning peas, contained 0.41 mg of ascorbic acid per gram when in the immature stage, 0.34 at maturity, and 0.29 mg when overmature. Determinations on the vitamin C content of different sieve sizes of 3 common varieties of canning peas showed that in a given variety the larger the peas the lower the percentage of ascorbic acid. Samples of 7 varieties were stored in the pod for 6 days at various temperatures and almost no loss of vitamin C resulted during storage at from 1° to 9° C., with considerable loss noted at from 18° to 22°.

The antiscorbutic principle in cabbage [trans. title], M. Podzimková-Rieglová (*Trav. Inst. Hyg. Pub. Tchécoslov., 7 (1936), No. 3, pp. 106–114, pls. 3*).—Following the same procedure as in previous studies (E. S. R., 72, p. 569), the vitamin C content of raw fresh cabbage and of raw and cooked saurkraut was determined. The materials were standardized against fresh lemon juice, 20 cc of which contained 20 international units of vitamin C.

The addition of 5 g daily of raw fresh cabbage to the scurvy-producing diet provided sufficient vitamin C to allow normal growth and prevent scurvy in the experimental guinea pigs. Similar results were obtained by a daily supplement of 20 g of raw saurkraut, while 5- and 10-g doses were found to be inadequate. A daily supplement of 40 g of cooked saurkraut did not prevent scurvy.

The author advocates the increased utilization of a cheap source of vitamin C, such as raw fresh cabbage, particularly during the late winter and spring seasons. When cooked fresh cabbage or raw saurkraut are consumed, the amounts eaten should be greatly increased. Cooked saurkraut cannot be considered a satisfactory source of vitamin C.

Effect of vitamin C administration on vitamin C of milk and urine of lactating mothers, F. T. Chu and C. Sung (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 1, pp. 171, 172*).—This report is based upon the results of simultaneous determinations of vitamin C in the milk and urine of two lactating mothers for from 26 to 27 consecutive days, respectively. Their diet was representative of the low-class Chinese family dietaries and was adequate in caloric intake, but very low in vitamin C. In addition one received 1,000 cc of canned orange juice for 12 days and the other 2,600 mg of ascorbic acid crystals for 8 days, beginning on the fifth day of the study. A total amount of 3,500 cc of fluid was

allowed daily. The output of vitamin C in 24-hr. milk and 24-hr. urine was calculated and compared from day to day.

The storage of vitamin C in the tissues of these mothers was very low at the beginning of the experiment, for no increase in urinary excretion resulted until the large dose of vitamin C had been given for 6 days in the first case and for 3 days in the second case. When the maximum excretion, amounting to approximately 60 percent of the intake, was reached, the daily urinary output of vitamin C remained fairly constant until the vitamin supplements were discontinued, following which the excretion dropped abruptly. Following the increase or decrease of vitamin C in the diet, the vitamin C content of the milk fluctuated slowly and steadily. After the milk had reached a "saturation" level of approximately 0.08 mg per cubic centimeter, the concentration of vitamin C remained quite high for about 10 days even after the large doses of vitamin C had been discontinued.

Pharmacologic and therapeutic properties of crystalline vitamin C (cevitamic acid), with special reference to its effects on the capillary fragility, I. S. WRIGHT and A. LILIENFELD (*Arch. Int. Med., 57 (1936), No. 2, pp. 241–274, figs. 7*).—Following a detailed review of the properties and the laboratory and clinical findings on cevitamic acid, the authors present case histories and summarize their experiences with the clinical use of crystalline vitamin C. The first series of cases is grouped under the heading of vitamin C deficiency, and the 20 patients with marked scurvy were promptly cured by the addition of crystalline vitamin C to the scurvy-producing diets. Three patients with purpura and 3 patients with true hereditary hemophilia showed doubtful results after the administration of crystalline vitamin C. A standardized modification of the tourniquet test for capillary fragility, which has been found very useful in the study of these cases, is presented.

Cevitamic acid is indicated for patients and infants who are unable to take citrus fruit juices, for cases of gastric or duodenal ulcer, and for severe ulcerative colitis. Patients who are unable to utilize vitamin C, even though the intake is adequate, may be successfully treated with cevitamic acid administered parenterally. Although the minimum dose of cevitamic acid required as a preventive has not been definitely established, the vitamin should be added to all diets poor in vitamin C to bring the content up to the 20- to 30-mg level.

As criteria of "subclinical" scurvy, the authors used the history of a diet poor in vitamin C taken over a protracted period of time, a definite increase in capillary fragility on several checked tests, and a response by a decrease in capillary fragility to within the normal range (0–10) on exactly the same regimen with the single addition of cevitamic acid.

Effect of crystalline vitamin C (ascorbic acid) on tolerance to tuberculin, M. M. STEINBACH and S. J. KLEIN (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 1, pp. 151–154*).—When tuberculous guinea pigs receiving a normal diet which included an abundance of fresh lettuce as a source of vitamin C were subjected to daily injections of crystalline vitamin C, an increased tolerance to repeated large doses of tuberculin was established. The results suggest that vitamin C may be of value in tuberculosis by combating the prolonged toxemia of the disease.

Studies on reduced ascorbic acid content of the blood plasma, L. D. GREENBERG, J. F. RINEHART, and N. M. PHATAK (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 1, pp. 135–139, figs. 2*).—The plasma ascorbic acid levels of seven normal adults were determined before and after the ingestion of 6 oz. of orange juice by deproteinizing the blood plasma with tungstic acid and titrating with

2,6-dichlorophenolindophenol according to the method of Farmer and Abt (E. S. R., 74, p. 135).

An appreciable rise of the ascorbic acid level of the plasma ranging from 15 to 69 percent was found from 2 to 4½ hr. after the administration of this relatively small dose of vitamin C. In four individuals receiving 0.5 g of ascorbic acid per 100 lb. of body weight, the ascorbic acid content of the plasma reached the peak from 2 to 4 hr. after ingestion. Determination of the postabsorptive plasma vitamin C concentration was made on 55 medical students. The average level was 0.72 mg percent, with 45 percent of the group showing values below 0.7 mg percent. A close parallelism was found between the plasma ascorbic acid values and the urinary excretion following test doses of from 250 to 300 mg of vitamin C. Experiments on three monkeys previously maintained on a suboptimal intake confirmed this finding.

The authors believe that fasting plasma ascorbic acid levels below 0.7 mg percent are probably suboptimal, levels ranging from 0.7 to 0.9 mg percent appear to be adequate, and optimal levels probably lie above this range. Reduced ascorbic acid plasma levels below 0.5 mg percent should be considered low. For satisfactory comparative data, determinations should be made on fasting blood specimens.

Reduced ascorbic acid content of blood plasma in rheumatoid arthritis, J. F. Rinehart, L. D. Greenberg, and F. Baker (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 2, pp. 347–350, figs. 2*).—In this preliminary report plasma ascorbic acid levels determined by the method of Farmer and Abt (E. S. R., 75, p. 588) are reported graphically for 36 cases of rheumatoid arthritis, 12 of which composed a control group in that they had been maintained for a period of months on a high vitamin C intake. The plasma ascorbic acid levels of this group ranged from 0.9 to 1.39 mg, with an average of 1.1 mg per 100 cc. The values for a second group of 21 cases ranged from 0.14 to 0.66 mg per 100 cc. This group included 5 for whom a high vitamin C intake had been prescribed but not followed systematically, and 3 others who had taken a good but not a high vitamin C supply for months. The latter were thought to have some fault in absorption or utilization, for in the majority of the other cases in the group the reduced ascorbic acid levels rose promptly following intensive vitamin C therapy. A final group of 3 cases of old inactive rheumatoid arthritis gave reduced ascorbic acid plasma levels of 0.59, 0.79, and 1.56 mg per 100 cc.

These results indicate that the blood plasma ascorbic acid (reduced form) in active cases of rheumatoid arthritis is regularly low if the individuals have not been maintained on a high vitamin C supplement, and suggest that in some cases the intake required to maintain adequate vitamin C levels in the plasma is much above the average requirement for normal individuals. The evidence supports the earlier theory (E. S. R., 71, p. 428) that vitamin C deficiency may operate as a contributory factor in the etiology of some cases of rheumatoid arthritis.

The effect of the administration of sodium bicarbonate and of ammonium chloride on the amount of ascorbic acid found in the urine, E. E. Hawley, J. P. Frazer, L. L. Button, and D. J. Stephens (*Jour. Nutr., 12 (1936), No. 2, pp. 215–222, figs. 2*).—Essentially noted from another source (E. S. R., 76, p. 567).

Cereals and rickets, VI, VII (*Biochem. Jour., 30 (1936), Nos. 2, pp. 177–188; 7, pp. 1126–1134*).—In continuation of this series of studies at the Wisconsin Experiment Station (E. S. R., 72, p. 571), two papers are presented.

VI. *The comparative rickets-producing properties of different cereals,* B. H. Thomas and H. Steenbock.—The authors report experiments on rats fed a

low calcium diet. Rolled oats, patent flour, whole wheat, polished rice, and yellow corn were compared in their capacity to produce rickets when they comprised 75 percent of the low calcium ration. When judged by bone analysis and the line test, these cereals were found to be very similar in their rickets-producing properties.

VII. *The role of inorganic phosphorus in calcification on cereal diets*, J. T. Lowe and H. Steenbock.—The experiments of Templin and Steenbock were repeated to determine the organic-inorganic phosphorus relations of germinated autolyzed corn, immature corn, and hydrochloric acid-treated corn when they replaced part of the cereal content of the Steenbock-Black rickets-producing ration 2965. The results are summarized as follows:

The germinated autolyzed corn was superior in antirachitic effect to mature and germinated corn, with evidence of an inverse relationship between the phytin-phosphorus content and antirachitic effectiveness. There was a progressive improvement in calcification when the calcium: phosphorus ratio of the diet was increased from 1:1 to 2.1:1, running parallel with the rise in phosphorus content. Phytin was not found to be a significant source of phosphorus, while sodium glycerophosphate proved superior to phosphoric acid as a phosphorus supplement to improved calcification. Immature corn was definitely less rachitogenic than mature corn, and this difference was correlated with a simultaneous rise in inorganic phosphorus. Immature corn and immature autolyzed corn, both containing the same amounts of inorganic phosphorus, showed comparative antirachitogenic effectiveness. The increase in inorganic phosphorus could be almost entirely accounted for by hydrolysis of phytin. A slight superiority in calcification occurred when hydrochloric acid-treated corn was included in the ration. The possible existence of other factors must be considered, since the increase in inorganic phosphorus content was not the only factor in improving calcification.

TEXTILES AND CLOTHING

Durability and resistance to water of certain umbrella fabrics, V. SYKES and K. CRANOR (*Amer. Dyestuff Rptr., 24* (*1935*), *No. 26, pp. 725–729, figs. 4*).—The umbrella fabrics tested were three plain weave silks, two plain weave silk and cotton mixtures, two twill weave cottons, one plain weave cotton, and one plain weave rayon. Chemical and physical tests were made to determine the number of yarns per inch, yarn twist, thickness of the fabric, diameter of the yarn, breaking strength, elongation, and folding endurance. Tests for waterproofing, the resistance of the fabric to breaking, and the fastness to light were estimated. Following a 2-mo. exposure to the weather, the samples were retested.

The highest breaking strength, warp folding endurance, and resistance to water were shown by the unweathered cotton fabrics. Cotton also showed the greatest resistance to folding endurance and edge breaking after weathering. The silk and rayon fabrics tested were less durable and were the lowest in water resistance. The deterioration of the silk fabrics during the weathering period prevented further tests. All of the weathered fabrics were low in resistance and lost color after the exposure to the weather for 1,501 hr. in midsummer. The data indicate that the most important factors influencing water resistance are closeness of weave, thickness of the fabric, diameter of the yarn, and the yarn twist.

Formaldehyde as a protective agent for wool, F. BARR and R. EDGAR (*Textile Res., 7* (*1937*), *No. 4, pp. 175–179, figs. 2; abs. in Iowa Sta. Rpt. 1936, pt.*

1, pp. 157, 158).—Tests similar to those previously conducted at the Iowa Experiment Station (E. S. R., 76, p. 140) on untreated wool were made on formaldehyde-wool.

Treatment with formaldehyde resulted in a 36 percent less loss in wet strength after subjection for 1 hr. at 100° C. to 0.25 N hydrochloric acid, and of a 25 percent less loss when 0.5 N acid was used. The formaldehyde-wool lost the same weight, 17 percent more sulfur, and 4 percent less nitrogen than the untreated wool in 0.75 N acid. In 6 N acid for 10 hr. at 10° the formaldehyde-wool showed less percentage weight, nitrogen, and wet strength losses, and a greater total sulfur loss. After 10 hr. of treatment in dilute sodium hydroxide at 40°, the residues were nearly constant in total nitrogen and nonsulfate sulfur, with less weight loss in the formaldehyde-wool, which had a measurable wet strength at 0.2 N alkali, a concentration approximately four times that beyond which the untreated wool failed. In concentrated alkali the percentage losses of nonsulfate sulfur, weight, and wet strength were the same for both wools, with the total nitrogen content of the formaldehyde-wool remaining unchanged while that of the untreated wool increased.

"Virgin wool" bats and wool-filled comforters in California, J. F. Wilson (*Natl. Wool Grower, 27 (1937), No. 1, pp. 18–20, figs. 2*).—The recently amended regulations administered by the Department of Professional and Vocational Standards of California regarding tags giving the definitions of virgin wool, blended wools, wool waste, and wool shoddy to be attached by the manufacturer to bedding and upholstery materials sold in California are outlined. The wool shoddy label must be red and the other three white. It is pointed out that these regulations fail to provide any guarantee that the article will have a high insulation value or give any information regarding the length of the fiber. A summary of data obtained from testing a comforter filling labeled "100 percent virgin wool" and another wool bat made from recarded white worsted thread waste illustrates that the label virgin wool may not be an indication of a good article.

Oxidative degradation of silk, R. L. Johnson, E. C. Walde, and R. Edgar (*Iowa State Col. Jour. Sci., 11 (1936), No. 1, pp. 5–14, fig. 1*).—In this study, conducted at the Iowa Experiment Station, the authors present quantitative data of the effect of hydrogen peroxide and aqueous potassium permanganate in 10 hr. at 40° C. on the weight, nitrogen, ash, and wet strength of wild silk fibroin, silk fibroin, and black iron-weighted, white lead-weighted, tin-weighted, tin- and lead-weighted and zinc-weighted silks of typical commercial quality.

The rapid loss of strength shown by the weighted silks treated with the permanganate was similar to that which occurred in dry cleaning and laundering lead-weighted and tin- and lead-weighted silks, as previously reported (E. S. R., 73, p. 573). The weighted silks were not changed in wet strengths by high concentrations of hydrogen peroxide, and the degree of degradation was less than by the permanganate. It has been shown that "nitrogen of wild silk fibroin is a decreasing linear function of the volume of potassium permanganate at a given concentration, that nitrogen of silk fibroin and nitrogen of wild fibroin are almost linear functions of the concentration of oxidant, that dilution of fibroin by weighting results in greater solution of its nitrogen upon oxidative degradation, and that loss and rate of loss in wet strength with increasing concentration of permanganate, different for the various fabrics, are greater than loss and rate of loss of fibroin."

Degradation of five weighted silk fibroins by steam, R. L. Johnson and R. Edgar (*Iowa State Col. Jour. Sci., 11 (1936), No. 1, pp. 15–20, figs. 2; abs. in Iowa Sta. Rpt. 1936, pt. 1, pp. 155–157*).—In continuation of previous studies

(E. S. R., 76, p. 140), the effect of subjecting weighted and unweighted plain woven silk fabrics to the action of steam for 1 hr. at from 0 to 38 lb. pressure and for from 1 to 5 hr. at 8 lb. pressure was investigated. Chemical analyses and tests to determine the wet strength of the residual fabrics were made.

The following percentage conversions of the fibroin to soluble forms of nitrogen in 1 hr. at 38 lb. pressure were observed: Lead-weighted 43.9, zinc-weighted 38.6, tin-weighted 35, tin- and lead-weighted 15.4, iron-weighted 10.9, and unweighted silk fibroin 4.5, and in 5 hr. at 8 lb. pressure the values observed were 38.3, 34.3, 19.3, 12.6, 10.4, and 2.3, respectively. The greatest conversion of fibroin was noted at pressures between 18 and 28 lb., with the exception of the tin-weighted silk which lost most between 28 and 38 lb., while at 8 lb. pressure the greatest loss took place in the 2- to 3-hr. steaming period except for the lead-weighted silk which lost most during the 4- to 5-hr. period. The silk fibroin and the tin-weighted silk withstood steam at a pressure of 18 lb. for 1 hr., and the tin-weighted, lead-weighted, and zinc-weighted silks showed no measurable wet strength after 1 hr. at 38 lb. pressure. A pressure of 38 lb. was required to cause browning of the silk fibroin, while the weighted silks became brown after 1 hr. of steaming at 8 lb. pressure. In 1 hr. at 38 lb. the zinc-weighted silk lost the most weight, 14.2 percent, and the tin-weighted silk showed the maximum decrease in the percentage of ash, 6.3. It would appear that the dilution of fibroin by wetting increased the conversion to soluble derivatives by steam, and that the loss in wet strength with increasing time or temperature was greater than the loss of fibroin.

HOME MANAGEMENT AND EQUIPMENT

The rural homemaker in southern Rhode Island as a paid worker, M. Whittemore and B. M. Kuschke (*Rhode Island Sta. Bul. 259 (1936), pp. 32, fig. 1*).—A survey was made of 624 rural women, or about one-fifth of the total number of married and unmarried women and girls of Washington County who were listed by the 1930 census as gainfully employed.

While most women gave more than one reason for working outside the home, approximately 85 percent listed necessity as the main reason and 33 percent worked to obtain "luxuries" such as electrical equipment and washing machines. To 7.7 percent it served as an outlet for surplus energy, 4.2 percent worked for financial independence, 1.8 percent to escape housework, and 10.4 percent to pay for the home, help relatives, educate children, or for other miscellaneous reasons. The following types of work were engaged in: Industrial, 1.1 percent. The average amount of money earned by 333 of the women was $17.79 per week.

A survey of the equipment in the homes showed that a large proportion had electricity and some were very completely supplied with modern equipment. About 60 percent of the income-earning homemakers bought at least three-fourths of the clothing for their families and about one-half bought all of the bread consumed, while one-third sent out part or all of their laundry and nearly 9 out of every 10 women bought canned foods.

"A few women felt that it was a hardship to have to carry on income-producing work in addition to that of the home, and a few others reported that their husbands did not like to have them do so. In most cases, however, both the worker and the family seemed not only willing but anxious that her work should continue."

Economics of the household: Its administration and finance, B. R. Andrews (*New York: Macmillan Co., 1935, rev. ed., pp. IX+626*).—This revised

edition of the text previously noted (E. S. R., 50, p. 797) "has been largely rewritten and enlarged at a number of points. The concept of management taken as the foundation principle of economic analysis has been extended, in a partial way at least, to the whole range of family household functions and interests." Chapters have been added on personality economics and bioeconomics of the family; business economics and social economics of the household; money income and the household; household budget studies; household credit and debt; family health, sickness, and death costs; and household buying and handling household resources.

[Studies in household equipment by the Iowa Station] (*Iowa Sta. Rpt. 1936, pt. 1, pp. 153, 154, 155, 156, figs. 4*).—This progress report (E. S. R., 75, p. 140) contains summaries of a continuation by L. J. Peet of studies on the application of heat from electric surface units to cooking utensils of different materials and finishes, and of tests by Peet and B. Lowe to determine the feasibility of baking cakes, rolls, biscuits, and cream puffs from a cold start in gas, electric, and kerosene ranges.

List of inspected household electrical appliances (*Underwriters' Labs. List HEA 736 [1936], pp. 103, pl. 1*).—This list contains household electrical appliances, small wiring devices, and other similar equipment.

MISCELLANEOUS

Annual report of the director [of Delaware Station] for the fiscal year ending June 30, 1936, C. A. McCue et al. (*Delaware Sta. Bul. 205 (1936), pp. 46, figs. 2*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report on agricultural research [of Iowa Station] for the year ending June 30, 1936, I, II, R. E. Buchanan et al. (*Iowa Sta. Rpt. 1936, pts. 1, pp. 220, figs. 25; 2, pp. 72, figs. 13*).—Part 1 of this report includes reports on all active projects except those relating to corn; part 2, a report on all work coordinated under the Iowa Corn Research Institute. The experimental work not previously noted is for the most part referred to elsewhere in this issue.

Forty-seventh Annual Report [of New Mexico Station, 1936], F. Garcia (*New Mexico Sta. Rpt. 1936, pp. 70, figs. 2*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Farm Research, April 1, 1937 (*Farm Res. [New York State Sta.], 3 (1937), No. 3, pp. 16, figs. 11*).—In addition to several articles asbstracted elsewhere in this issue, there are included Much Seed Research May Be Done on the Farm, by M. T. Munn (p. 2); New Crops for Old Lands, by U. P. Hedrick (pp. 4, 9); The Rock Alpines (p. 8); and Pear Midge Control, by F. G. Mundinger (p. 9).

Results of field crop, shelterbelt, and orchard investigations at the United States Dry Land Field Station, Ardmore, S. Dak., 1911–32, O. R. Mathews and V. I. Clark (*U. S. Dept. Agr. Circ. 421 (1937), pp. 48*).—The experimental work not previously referred to (E. S. R., 58, p. 396) is for the most part noted elsewhere in this issue.

Bibliography of tropical agriculture, 1934, 1935 (*Roma: Internatl. Inst. Agr., 1935, pp. VII+247; 1936, pp. VII+256*).—Continuing the series (E. S. R., 72, p. 142), these classified bibliographies deal with the years 1934 and 1935, respectively. Annotations in English and French are given.

NOTES

Delaware University and Station.—Dr. J. F. Adams, associate professor of plant pathology and soil bacteriology and associate plant pathologist and soil bacteriologist, has resigned to engage in commercial work on August 1.

Florida University.—A 10-story building, originally designed for a hotel and located somewhat nearer the main part of Gainesville than the campus, has been acquired by the university through the use of State and private funds, and its construction has been practically completed. It will house the State museum, the general extension division of the university, the State plant board, radio studios, and some other departments.

Indiana Station.—Dr. R. M. Caldwell of the U. S. D. A. Bureau of Plant Industry has been appointed chief of the department of botany, and Dr. R. W. Samson assistant chief.

Iowa College and Station.—Dr. A. G. Norman, biochemist at the Rothamsted Experimental Station, has been appointed professor of soil bacteriology and soil bacteriologist beginning in September. Dr. Walther Kubiena, professor of agronomy in the Hochschule für Bodenkultur of Wien (Vienna), is serving as guest professor of soils for 6 months, giving instruction in his new method for the microscopic examination of soils and studying the application of this micropedological technic to the genetics of soils, the microflora, and the characteristics of soils which affect erosion.

Kansas College.—Honorary degrees of doctor of science were conferred at the recent commencement on Dr. Flora Rose, director of the College of Home Economics of Cornell University, and F. C. Sears, professor emeritus of horticulture at the Massachusetts College.

Louisiana University and Station.—Dr. William Carver Schofield of the Maryland Livestock Service Laboratory has been appointed instructor in veterinary medicine and assistant veterinarian, dividing his time equally between teaching and the investigation of poultry diseases.

Maine Station.—*Science* notes the retirement in June of Dr. Edith M. Patch, entomologist since 1904.

Massachusetts College.—The honorary degree of doctor of science was conferred at the recent commencement on Dr. Charles S. Plumb, '82, emeritus professor of animal husbandry in Ohio State University.

Missouri University and Station.—At the recent commencement the LL. D. degree was conferred on Dean and Director C. B. Hutchison of the California University and Station.

Exercises honoring Dr. J. W. Connaway, associated with the institution for 49 years, mainly as professor of veterinary science and veterinarian, were held June 22.

The registered saddle stallion, Dysart McDonald No. 12162, bred and raised at the station, has been sold to the Dominican Republic for use in the improvement of saddle stock.

New York State Station.—The retirement is announced of Director U. P. Hedrick, to be effective on January 15, 1938. Clinton Stimson has been appointed to a new fellowship providing for studies on changes in vitamin potency in fruits and vegetables during their preparation for freezing.

Cornell University and Station.—Ground has been broken for a new building for the New York State Veterinary College to be named in honor of the late Dean Veranus A. Moore. It is expected that this building will be completed about May 1, 1938, at a cost of about $300,000. It is a 3-story structure, L-shaped, with a 117-ft. frontage and 170-ft. depth, and is faced with native stone to harmonize with the newer buildings of the university.

An experimental aviary has been built on the top of Fernow Hall, which houses the department of ornithology. This aviary, a metal encased structure, will have large wire cages, containing smaller shelters to protect the birds, and a hall the length of the aviary where bird experts may experiment, store food and equipment for the birds, and record results. Another use of the aviary will be to study bird migration. Birds will be confined therein during periods of the year when they normally migrate to discover how long this desire to migrate persists and how it relates to physical changes in the birds.

Dr. T. Lyttleton Lyon, for 31 years professor of soil technology and head of the department of agronomy since 1911, retired on July 1. He was succeeded by Dr. Richard Bradfield, professor of soils in Ohio State University and associate agronomist in the Ohio Station.

North Dakota Station.—Dr. Perry F. Trowbridge, director from 1918 to 1934 and widely known for his contributions to meat investigations, died May 15 at the age of 71 years. A native of Michigan and a graduate of its State normal school and university, Dr. Trowbridge received the Ph. D. degree in 1906 from the University of Illinois, where he had become assistant professor of chemistry. From 1907 to 1918 he was assistant professor and professor of agricultural chemistry in the University of Missouri. In 1918 he also served as president of the Association of Official Agricultural Chemists.

Pennsylvania College and Station.—The Regional Laboratory for Pasture Reearch (E. S. R., 75, p. 3) was dedicated May 4. Addresses descriptive of the policy and program of the laboratory were made by Dr. J. T. Jardine, Director of Research and Chief of the Office of Experiment Stations, U. S. Department of Agriculture; P. V. Cardon, head of the Division of Forage Crops and Diseases, U. S. D. A. Bureau of Plant Industry; and Dr. R. J. Garber, director of the laboratory. A conference followed of directors of all State experiment stations in the 12 Northeastern States regarding cooperative relations, and a plan was agreed to whereby each station will be represented on the advisory council by a member who will be appointed a collaborator by the U. S. Department of Agriculture.

The laboratory and attached greenhouses have been built at a cost of about $100,000. The college has also made available about 30 acres of land for field experiments. A staff of six specialists began operations on July 1.

Vermont University and Station.—A Golden Anniversary Reunion dinner and reception were held under the auspices of the Agricultural College Alumni Association on June 12 in honor of Dean and Director J. L. Hills, thereby giving recognition to his 50 years of service, which began on March 12, 1888.

Virginia Station.—A prize of $50 has been awarded by the State Academy of Science to R. G. Henderson, assistant plant pathologist, for a paper entitled Studies on the Downy Mildew of Tobacco.

Wisconsin University.—Warren W. Clark has been appointed associate director of agricultural extension.

EXPERIMENT STATION RECORD

VOL. 77 SEPTEMBER 1937 No. 3

THE DEPARTMENT OF AGRICULTURE APPROPRIATION ACT, 1938

Appropriations carried in the act for the support of the Federal Department of Agriculture for the fiscal year ending June 30, 1938, signed by the President on June 29, 1937, aggregate $802,245,208. This is greatly in excess of the provisions in corresponding acts for previous years, but this is mainly because for the first time the expenditures of the Agricultural Adjustment Administration are included. The authorization for this agency is $500,000,000, and $180,000,000 additional is for roads. Other major allotments are $24,390,780 for the Soil Conservation Service, $18,892,182 for the Forest Service, $15,864,000 for the cattle disease elimination campaign, $13,690,672 for extension work, $10,373,098 for the Bureau of Animal Industry, $6,212,698 for the Bureau of Agricultural Economics, and $6,120,000 for payments to the States for experimentation under the Hatch Act and supplementary legislation.

Comparable appropriations for the previous year totaled $666,916,606. The difference, a resultant of various increases and decreases, is thus $135,328,602. Of this amount $112,000,000 represents enlarged provision for roads activities, and there is an increase of $30,000,000 for the AAA.

No detailed estimate is available at the time of writing as to the funds available for research, but existing projects are for the most part continued, in some cases with increased allotments, and there are a number of new undertakings. Provision was duly made for the full amount of the special research fund authorized for the Department under the Bankhead-Jones Act of 1935, so that for this purpose $1,200,000, an increase of $400,000, will be available.

The Bankhead-Jones funds for the State experiment stations are further enlarged by $600,000, as authorized by the act, making $1,800,000 available to them plus the usual $720,000 under the Hatch Act, a like amount under the Adams Act, and $2,880,000 from the Purnell Act. In addition there are supplementary payments of $52,066 for work in Hawaii, $22,500 in Alaska, and $107,245 in Puerto Rico. These represent an increase of $7,500 for Alaska but a

net decrease of $10,000 for Hawaii. The allotment for Puerto Rico will again be divided between the Territorial and Federal stations, the former receiving $40,000 for research on problems of local concern and the latter $67,245 for development as a tropical outpost station of the Department.

For the expenses of the Office of Experiment Stations itself, $161,735 (plus $24,000 from Bankhead-Jones funds) will be available for the administration of the various experiment station acts, the publication of *Experiment Station Record*, and related purposes. This is an increase of $8,000 over the previous year, as authorized under the Bankhead-Jones legislation.

The funds administered by the Extension Service are increased from $13,330,672 to $13,690,672. The full authorized increase of $1,000,000 in Bankhead-Jones funds is provided, but $645,000 has been deducted from certain other supplementary funds hitherto available under a sliding scale arrangement designed to effect their complete replacement by Bankhead-Jones funds by 1940.

The Weather Bureau is allotted $4,703,049, an increase of $830,025. Of this amount, $696,090 is for additional aerological work, mainly commercial airway meteorological service, and including $140,000 for this purpose transferred from funds hitherto appropriated to the U. S. Department of Commerce.

An increase from $10,063,963 to $10,373,098 is indicated for the Bureau of Animal Industry. The principal item of increase is $174,806 for the Federal meat inspection, making the total for this purpose $5,433,000. There is also $103,000 additional for the tuberculosis eradication work of the Bureau, for which $1,603,000 will be available. Of this amount, $499,884 is for the payment of indemnities, and this is supplemented elsewhere in the act by authorizations of the use of $15,894,000 carried in special legislation for the elimination of diseased dairy and beef cattle. A new item is a provision of $10,000 for the study of periodical ophthalmia, or "moon blindness", in horses and mules.

Comparatively few changes are made in the allotments for the Bureau of Plant Industry, but its total rises from $4,551,206 to $4,833,048. Among the new expenditures authorized are $100,000 for the construction of a sugarcane laboratory at Houma, La., to replace a structure destroyed by fire, $15,000 for a wheat laboratory at Manhattan, Kans., $87,693 for additional land and increased maintenance costs at the National Arboretum, and $29,000 for the development of improved deciduous fruits and vegetables.

A total of $18,892,182 is provided for the Forest Service. Entering into its $1,153,677 net increase over the previous act are $500,000 additional for the acquisition of land for national forests, $610,000 additional for National Forest administration, and $171,409 for forest research.

The funds provided for the Bureau of Entomology and Plant Quarantine show a net increase from $5,567,675 to $5,711,398. This is apportioned among a large number of projects, such as $75,000 additional for Japanese beetle control, a like amount to begin a campaign against the sweetpotato weevil, $39,972 additional for phony peach and peach mosaic eradication, $79,475 additional to combat insect pests of forests and ornamentals, $50,000 additional for white pine blister rust control, $199,704 additional for Dutch elm disease eradication, $19,961 to extend scouting operations for the pink bollworm, $24,992 for an extension of the insect pest survey, $54,044 additional for the foreign plant quarantine, and $10,000 additional for an investigation of tick infestation around the island of Martha's Vineyard, Mass. On the other hand, there is a reduction in the funds available for screwworm control from $460,000 to $75,000 (plus $22,452 additional for studies of more effective methods of control).

There is an increase from $1,961,224 to $2,127,840 for the Bureau of Biological Survey, the largest addition being one of $114,228 for the maintenance of additional game ranges and bird refuge areas. An increase of $33,000 for biological investigations is provided for expanding studies in forest wildlife relationships and the establishment of additional wildlife research stations, as well as increases of $9,888 for reopening the Blackwater, Md., Experiment Station for studies in the production of muskrats and other fur animals, and one of $7,500 for further cooperation with other public agencies in food habits investigations.

The allotments for the Bureau of Agricultural Economics show a total of $6,212,698 and a net increase of $219,802. Of this amount $72,496 is for additional studies in farm management and practice and the marketing and distributing of farm products, $24,943 for additional statistics (including $10,000 for peanuts under an act of June 24, 1936), and $99,015 more for the enforcement of various inspection measures.

Increases from $219,085 to $245,085 are authorized for the Bureau of Home Economics. These will permit of increased research on wool utilization and other projects and provide for an expansion of the home economics information service.

The Commodity Exchange Act of June 15, 1936, replaced the Grain Futures Act of 1922, extending the jurisdiction of the Department to futures trading and exchange practices affecting cotton, millfeed, butter, eggs, potatoes, and rice. A total of $500,000, an increase from $296,500, is made available to the newly established Commodity Exchange Administration for the enforcement of the act.

One of the major increases is allotted to the Bureau of Public Roads, the total for this Bureau rising from $60,000,000 to $167,-

500,000. Of this amount, $155,000,000 is for Federal aid highway construction, $10,000,000 for the elimination of grade crossings, and $2,500,000 for public lands highways. There is also an increase from $8,000,000 to $12,500,000 in the appropriations for the construction of forest roads and trails.

A decrease from $24,869,265 to $24,390,780 is noted in the aggregate for the Soil Conservation Service, mainly in its allotment for soil and moisture conservation operations, demonstrations, and information. An appropriation of $1,540,780 for soil and moisture conservation investigations is continued unchanged. In addition to investigations on entire experimental drainage units, this will provide for work under controlled plat conditions on the 19 experiment stations now being maintained in 15 States.

As already noted, the act provides for the first time for the operations begun by the Agricultural Adjustment Administration and continued since February 29, 1936, under the Soil Conservation and Domestic Allotment Act. An appropriation of $340,000,000 is made for this project, together with not to exceed $160,000,000 of funds previously available.

The remaining work of the Department is provided for much as at present. The Bureau of Chemistry and Soils receives $1,425,431, an increase of $27,159, mainly for extending research on the industrial utilization of farm products; the Bureau of Agricultural Engineering, $460,769, an increase of $22,500 to develop data on small supplies of irrigation water and better farm buildings; the Bureau of Dairy Industry, $703,694, an increase of $6,600; and the Food and Drug Administration, $2,227,758, an increase of $150,000. There is again allotted $75,000 for administrative purposes at the Beltsville Research Center. The Office of Information receives $1,254,130, an increase from $1,217,532, and the Library $105,420, an increase from $103,800.

The foregoing discussion does not include the Resettlement Administration, transferred to the Department of Agriculture on January 1, 1937, but still financed separately, mainly through emergency relief appropriations which aggregated to March 20, 1937, $474,051,-854. Neither has it seemed feasible to bring into the picture various supplementary funds which have been or may be available, nor to attempt to evaluate the effect of an impounding by Executive order of appropriations granted or the possibility of a subsequent reduction in these appropriations by Congressional action. The aim has been merely to attempt a comparison, based on the Agricultural Appropriation Act, as to the general outlook at this time for those agencies specifically financed by this act with their status in the previous year.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the Indiana Station] (*Indiana Sta. Rpt. 1936, pp. 62, 67*).—This report briefly summarizes methodological work to serve as a basis for studies of the quality and quantity of the corn proteins. Studies on the composition and quality of soybeans are also noted.

[Chemical investigations of the Washington Station] (*Washington Sta. Bul. 342 (1936), pp. 74, 75*).—This reports, in cooperation with the U. S. D. A. Bureau of Chemistry and Soils, beverage investigations and fruit byproducts utilization, both by H. H. Mottern, O. Johnson, and P. D. Isham.

Soluble starch: A study of its properties with a recommended supplementary procedure for determining its suitability for use in the Lintner determination, S. R. Snider and D. A. Coleman (*Cereal Chem., 14 (1937), No. 1, pp. 1–17*).—In a joint investigation carried out by the U. S. D. A. Bureaus of Plant Industry and Agricultural Economics, the authors have brought out some important criteria for soluble starches to be used in the Lintner procedure for estimating diastatic activity. A low phosphate content as indicated by a low ash content appears to be very desirable. Freshly made solutions of the starch preparation should be used for accurate results. "Starches yielding cloudy solutions should be avoided, as the suspended undissolved particles would interfere in any gravimetric determination. Precipitation of starch will also interfere with Kjeldahl's law of proportionality. Reducing substances in soluble starch should not exceed 1 percent, in terms of maltose. Soluble starch solutions should be at least alkaline to methyl orange, and acid to rosolic acid. However, the ideal condition would be neutral to brom cresol green. . . . The erythrodextrin-iodide index should not exceed 10.

"Qualifications relative to the clarity of soluble starch solutions and the rate and quantity of deposition of unchanged starches should be included as specifications for suitable soluble starches. The requirements of the A. S. B. C. and the A. O. A. C. for soluble starch for use in the Lintner determination are too severe, as no soluble starch of commercial preparation has been found which will meet their specifications."

Products of fermentation of the S and R forms of yeasts, F. W. Fabian and L. J. Wickerham (*Jour. Agr. Res. [U. S.], 54 (1937), No. 2, pp. 147–158, fig. 1*).—From determinations of the pH values and titratable acidities, volatile acids, nonvolatile acids, alcohol, and esters in the fermentation products of *Saccharomyces cerevisiae*, *S. aceris-sacchari*, *Pichia alcoholophila*, and *Willia anomala* in cider, malt-extract broth, and a synthetic medium, the authors of this contribution from the Michigan Experiment Station conclude that "(1) in some species of yeasts there is a marked difference in the fermentation properties of the S and R forms. In other species there is little or no difference. (2) The S forms produced more alcohol in a shorter length of time than did the R forms. (3) The production of volatile acids was extremely variable. The amount produced varied with the different media, with the species of

yeast, and with the S and R forms of the different species. (4) The production of esters by the S and R forms of the four species of yeasts does not show as great variation as the production of volatile acid. There are some exceptions to this. The most important is the S form of *S. cerevisiae* Saaz in malt-extract broth and cider. In these media the amount of esters produced by the S form is practically nil, while the amount produced by the R form is 1 g per 100 cc. Another exception is in malt-extract broth, where the S form of *S. aceris-sacchari* produced 69 percent more esters than the R form. The SR form of *W. anomala* produced 30 percent more esters in cider than the R form and 61 percent more in the synthetic medium. *P. alcoholophila* produced practically no esters in any of the media.

"(5) The conditions under which the yeasts are grown influence the ester production. Sufficient oxygen to maintain normal growth produced the largest amount of esters. When there was an abundance of oxygen or insufficient oxygen no esters were produced. (6) In the yeasts which produced esters, the esters did not appear in appreciable quantities until 35 to 45 days after inoculation. Shortly after the esters appeared there was a corresponding decrease in alcohol and volatile acids. In the case of the S form of *S. cerevisiae* Saaz there was a moderate volatile acid and high alcoholic content in malt-extract broth, but practically no esters were formed. (7) The three media used affected the stability of the yeasts differently. The S and R forms of the species which grew in the synthetic medium were very stable in that medium, the S form showed no tendency to change to the R form, nor the R form to change to the S form. In the cider, however, the tendency to change was greater, and in the malt-extract broth it was still greater."

A collaborative study of the manometric determination of gassing power, R. M. Sandstedt (*Cereal Chem.*, *12* (*1935*), *No. 5*, *pp. 517–519*).—The author reports from the Nebraska Experiment Station that "the collaborative results are obviously very concordant and leave no doubt that this is a precise method, capable of giving values that can be duplicated at any time in any laboratory having the necessary pressuremeter equipment. . . .

"Five percent of yeast gives just as good checks as does 3 percent, but the gain in time by the use of 5 percent of yeast on flours of normal diastatic activity is not enough to justify its preference over 3 percent of yeast, which moreover is the amount used in the standard A. A. C. C. baking test."

On the biochemistry of the methane fermentation, H. A. Barker (*Arch. Mikrobiol.*, *7* (*1936*), *No. 4*, *pp. 404–419*).—The author, at the California Experiment Station, reports upon the experiments designed to test "the hypothesis that all the methane produced by fermentation owes its origin to a reduction of carbon dioxide. This implies that the ordinary organic fermentation substrates fulfill the function of hydrogen donators for this reduction according to the equation: $4\ H_2A + CO_2 \rightarrow 4\ A + CH_4 + 2\ H_2O$. With the object of testing this hypothesis the methane fermentation of ethyl and butyl alcohols was investigated. These substrates were chosen because it was expected that they might be dehydrogenated only as far as the corresponding acids. If this happened, any methane produced could only have been formed by a reduction of carbon dioxide. The first quantitative experiment on the fermentation of ethyl alcohol showed that the fermentation proceeded in accordance with the above expectation. The alcohol was dehydrogenated almost quantitatively to acetic acid, and at the same time there was consumed a quantity of carbon dioxide equivalent to the methane formed. A second experiment completely confirmed this latter relation. These results constitute convincing proof that in this process methane arises by reduction of carbon dioxide."

An experiment with butyl alcohol as a substrate yielded results which gave additional support to the hypothesis. "Butyl alcohol is first dehydrogenated to butyric acid with simultaneous uptake of carbon dioxide, the butyric acid then being further dehydrogenated to acetic acid. Both processes are accompanied by a production of methane.

"The methane fermentation of acetic acid is regarded as being a dehydrogenation of the acid accompanied by a reduction of carbon dioxide just as are the fermentations of the alcohols; the postulated disappearance of carbon dioxide by reduction is, however, in this instance obscured by a simultaneous production of carbon dioxide as a result of the complete dehydrogenation of the acetic acid. The probable mechanism of this fermentation is expressed by the equation $CH_3COOH + 2\ H_2O + CO_2 \rightarrow 2\ CO_2 + CH_4 + 2\ H_2O$. Evidence obtained in this investigation renders highly improbable the assumption that acetic acid can be a normal intermediate in the reduction of carbon dioxide to methane. The view is favored that this process is a plain reduction, involving the intermediate formation of one-carbon-atom compounds only."

Attention is drawn to the broader implications of the results described in regard to the mineralization of organic materials under anaerobic conditions, and the general problem of carbon dioxide reduction in natural processes.

Studies upon the methane-producing bacteria, H. A. Barker (*Arch. Mikrobiol., 7 (1936), No. 4, pp. 420–438, figs. 13*).—The author also presents "a survey . . . of the non-spore-forming methane-producing organisms on the basis of the rare descriptions scattered throughout the literature." The great difficulty of isolating these organisms and methods which make possible the growth of various representatives of this group in solid media are described.

"For the first time highly purified cultures of four different types have been obtained by transferring single colonies into appropriate culture media, but it has not as yet been possible to isolate strictly pure cultures. Nevertheless the purified cultures allowed of a positive identification are on the basis of morphological and physiological characters of four clearly distinct types of methane-producing organisms which have been described under the names of *Methanosarcina methanica, Methanococcus mazei, Methanobacterium söhngenii,* and *M. omelianskii.*"

An improved method for ashing of plant material, W. D. Stewart and J. M. Arthur (*Contrib. Boyce Thompson Inst., 8 (1936), No. 3, pp. 199–215*).—Ashing of plant tissues in a muffle at 650° C. for periods of 8 and 16 hr. was compared with ashing in a combustion tube furnace for the same periods at 450° with oxygen.

Variation between duplicates and variation with repetition of ashing were less for ashing in the tube at 450° with oxygen than for the muffle at 650°. Greater losses of ash were found with increasing temperatures but little correlation with increased periods of heating. Higher ash content was found at the lower temperature. The difference consisted of increased carbonate and chloride content and higher content of volatile inorganic constituents.

The loss due to volatilization varied both with plants of the same species grown under different conditions and with different species. When the sulfates, carbonates, and chlorides of potassium, calcium, and magnesium were heated to 450°, none of these constituents were lost except chlorides of magnesium. At 650°, 700°, and 750°, both chlorides of potassium and calcium and the metals themselves were lost by sublimation. All sulfates tested were found stable at all the temperatures used.

Addition of chemicals, and especially sulfuric acid, to aid ashing resulted in higher values for the ash. In the case of the acid this increase was found

due to the conversion of chlorides and carbonates to sulfates with a resultant increase in molecular weight. Total base determinations were found to be unsatisfactory, due to nonvolatilization of phosphorus and hence incomplete conversion of bases to sulfates.

A method for ashing which was found to be superior to the usual method employed for plant material is described as follows:

"Only tissue from plants protected from spattering of soil by rain or watering should be used. The dry material is finely ground and, if a metal mill is used for grinding, any particles of metal are removed with a small magnet. Small weighing bottles are loosely filled with the material, placed in an oven at 100° for 2 hr., removed and allowed to cool over calcium chloride. Portions of 0.3 to 0.5 g are then weighed, preferably by difference in weight of bottle before and after removal of material, into tared porcelain capsules that have been cleaned well previously, burnt in a muffle at 650°, and permitted to cool in a desiccator over calcium chloride. The material in the capsules is now flamed with a lighted match before being placed in the tube for ashing, since some tissues are of such composition as to ignite explosively upon heating. The furnace should be of the combustion tube type with the heating units completely encircling the tube and with resistance units adjusted to give an operating temperature of 450°. The capsules are placed into a metal holder and so placed in the tube that each capsule is equidistant from the center of the tube. The tube is now inserted into the hot furnace, the center of the tube coinciding with the center of the furnace. A cork holding the lead from an oxygen tank is now placed in the tube and a rapid flow of dry, washed oxygen, passing through a bubble counter, is led over the samples in order to avoid explosions. After 15 min. the rate of flow of oxygen is reduced to approximately 60 bubbles per minute. After 8 hr. the samples are removed, placed in a desiccator over calcium chloride, permitted to cool, and weighed."

The determination of zinc in foods, N. D. SYLVESTER and E. B. HUGHES (*Analyst, 61 (1936), No. 728, pp. 734–742*).—The authors describe a method of extracting zinc from the ash of foods by means of diphenylthiocarbazone and a micromethod of titration of the separated zinc with potassium ferrocyanide in acetic acid solution, with diphenylbenzidine and potassium ferricyanide as internal indicators. This method is suitable for the determination of zinc in amounts of from 0.2 to 1 mg if the amounts of bismuth and cadmium present are not greater than 2 mg. Another micromethod of titration is described, which is specific for zinc and is accurate for amounts up to 0.3 mg, in which the iodine liberated from the potassium iodide in the presence of potassium ferricyanide is titrated with sodium thiosulfate solution. By this method accurate recovery of 1 p. p. m. may be obtained on a 50-g food sample. The normal zinc content of a number of food samples is given, including loganberries, raspberries, apples, carrots, potatoes, beetroot, spinach, cabbage, eggs, white and wholemeal flour, wheat germ, and wheat bran, showing a variation from 0 in the new-laid egg white to 145 p. p. m. in wheat germ.

Mercuric chloride as a preservative for milk samples held for the determination of lactic acid, H. C. TROY and P. F. SHARP (*Jour. Dairy Sci., 20 (1937), No. 2, pp. 77–81*).—With reference to previous recommendations of the authors (E. S. R., 74, p. 5) concerning the use of mercuric chloride as a preservative for milk samples held for the determination of lactic acid, further study has indicated that milk may be satisfactorily preserved up to 1 mo. when not less than 0.5 percent of mercuric chloride is added, the sample heated to 80° C. for 5 min., cooled, and held at 20° or lower, preferably in the dark.

Factors affecting maltose values in the ferricyanide method for diastatic activity, H. W. PUTNAM, M. J. BLISH, and R. M. SANDSTEDT (*Cereal Chem., 12 (1935), No. 5, pp. 494–504*).—In an investigation reported from the Nebraska Experiment Station, the authors find it essential, for highest accuracy, that the manipulations be carried out with the least delay and with close attention to specifications. Samples treated with acetic acid reagent, as well as filtrates acid with sulfuric acid, produce higher results if allowed to stand. It is believed that aliquots alkaline with ferricyanide reagent may be stored cold for reasonable periods with but slight change. Apparent reduction in diastatic activity at room temperatures was noted, whereas no detectable changes occurred at 0° C.

Various practical suggestions are offered, covering standardization of thiosulfate, preservation of thiosulfate, convenience in handling buffer, a caution against iodine loss in hot weather, and preparation of sand for ignition.

Identification and measurement of factors governing diastasis in wheat flour, R. M. SANDSTEDT, M. J. BLISH, D. K. MECHAM, and C. E. BODE (*Cereal Chem., 14 (1937), No. 1, pp. 17–34, figs. 8*).—It has been shown at the Nebraska Experiment Station that "the average bakers' flour contains, in addition to an abundant supply of beta-amylase, at least one other enzyme or 'activator' that affects rate of starch conversion in the autodigestion of flour or dough. This may conceivably be 'alpha-amylase', it may be 'amylo-kinase', or it may be a cytase, or a combination of these factors. . . . Flours vary as to the quantity of this factor which they contain. Soft wheat flour apparently contains very little of it, and the same is probably true of durum wheat flour.

"By far the greater portion of flour starch is 'raw' starch and unavailable to the beta-amylase that is so abundantly present, but all flours contain very significant amounts of 'available' starch as well. The available portion supposedly consists partly of ruptured or broken starch granules, and partly of starch that, due to structural peculiarities, is less resistant than the main portion. Flours vary as to quantity of available starch. Durum wheat flour contains by far the most, and soft wheat flour the least. The higher maltose value of commercial flour, as compared with experimentally milled flour, is probably due primarily to a difference in amount of ruptured starch granules.

"With the possible exception of durum wheat flour and excluding the so-called available fractions, the unruptured starch granules of various flours are for all practical purposes identical in their resistance to attack by enzymes. . . .

"The enzymes that are chiefly concerned in the autodigestion of flour starch may be almost completely and quantitatively extracted from flour by sodium chloride solutions, from which they may be precipitated with alcohol."

Reports on biological standards.—IV, The standardisation and estimation of vitamin A, edited by E. M. HUME and H. CHICK ([*Gt. Brit.*] *Med. Res. Council, Spec. Rpt. Ser. No. 202 (1935), pp. 61*).—This report, which includes the complete report of the Second International Conference on Vitamin Standardization of the League of Nations (E. S. R., 73, p. 132), summarizes the work of the vitamin A subcommittee and presents a collection of technical information, most of which is not available elsewhere, concerning the properties and use of the international vitamin A standard. It is intended for the information of competent workers already practiced in the usual methods for the quantitative estimation of the vitamin.

The material is presented in three main sections dealing, respectively, with carotene as the international standard for vitamin A, the spectrophotometric method of estimating vitamin A by means of the extinction coefficient at 328 mμ, and the use of cod-liver oil as a subsidiary international standard for vitamin A.

Some of the original data upon which the report is based have been presented in journal articles by the individual workers, including Lathbury (E. S. R., 73, p. 745), Lathbury and Greenwood (E. S. R., 73, p. 881), Dyer, Key, and Coward (E. S. R., 73, p. 722), Moore (E. S. R., 71, p. 134), and Morgan, Edisbury, and Morton (E. S. R., 76, p. 4). Protocols of other experiments and certain technics are appended.

A chemical determination of aneurin (= vitamin B_1) by the thiochrome reaction, B. C. P. Jansen (*Rec. Trav. Chim. Pays-Bas, 55 (1936), No. 11, pp. 1046–1052*).—A quantitative method of estimating vitamin B_1, based on the observation by Barger that aneurin (vitamin B_1) is oxidized to thiochrome by potassium ferricyanide in alkaline solution, is presented. The fluorescence due to the thiochrome was measured in the fluorometer, using a photoelectric cell and taking galvanometer readings. For a solution of pure aneurin, 0.1 cc (containing 1γ–20γ), was placed in a glass stoppered cylinder and 0.1 percent solution of potassium ferricyanide was added. For 1γ of aneurin from 0.01 to 0.1 cc was required, for 10γ from 0.03 to 0.1 cc, and for 20γ from 0.1 to 0.2 cc. After mixing, 3 cc of 10-percent sodium hydroxide solution was added, and the solution was again mixed and extracted within from 1 to 2 min. with 13 cc of isobutyl alcohol. The two layers were separated by centrifuging, and 10 cc was pipetted from the upper layer into the vessel of the fluorometer for reading determinations.

For the international standard adsorption powder of vitamin B_1, from 10 to 50 mg of the powder was placed in a glass-stoppered cylinder and 3 cc of the 10-percent sodium hydroxide solution was added, followed by the requisite amount of a 1-percent solution of potassium ferricyanide. If 10 mg of powder was taken, from 0.05 to 0.1 cc of the ferricyanide was needed; if 30 mg was taken, from 0.1 to 0.2 cc; and if 50 mg was taken, 0.3 cc was required. After stirring from 5 to 10 min. the mixture was extracted with 13 cc of isobutyl alcohol. Following centrifuging, 10 cc of the upper layer was measured into the fluorometer vessel. The fluorometer was standardized by the fluorescence of a solution of quinine in N/10 sulfuric acid (3 mg to 100 cc). Very good agreement was obtained between this method and the biological assay of the international standard.

The method was followed for the assay of a yeast extract to which a known quantity of aneurin had been added. Ten cc of an approximately 25-percent yeast extract in water at pH 3 was treated with 20 cc of methanol, the precipitate was removed by centrifuging, and 1 cc was mixed with from 0.1 to 0.3 cc of 1-percent ferricyanide, 1 cc of methanol, and 1 cc of 30-percent sodium hydroxide solution. This mixture was then extracted with 13 cc of isobutyl alcohol, following the procedure previously described. Alternatively, the solution from the methanol precipitation was treated with fuller's earth (300 mg per 15 cc), and the technic described for the standard powder was followed. Nearly all of the added aneurin was recovered.

Origin of vitamin C and experimental evidences supporting Sah's hypothesis, P. P. T. Sah (*Jour. Chin. Chem. Soc., 4 (1936), No. 6, pp. 457–462*).—The author presents chemical evidence to support the theory he proposed in 1933 that *l*-ascorbic acid has the same origin as the sugars to which it is structurally related and, therefore, could be synthesized from *d*-glucose, starch, or citrus peels. Other investigators have reported the synthesis of vitamin D from *d*-glucose through *l*-sorbose. The author has obtained a synthetic *l*-ascorbic acid from starch.

Estimation of ascorbic acid (vitamin C) by titration, H. Cheftel and M. L. Pigeaud (*Nature [London], 138 (1936), No. 3497, p. 799*).—When using the

Harris and Ray modification (E. S. R., 70, p. 426) of the Tillmans method, it is suggested that a more constant end point will be obtained if the ascorbic acid solution is cooled to 0° C. and the titration is carried out at this temperature, thus slowing down appreciably the oxidation and eliminating time as a fundamental factor in the results.

Sorghum sirup, G. A. Shuey (*Tennessee Sta. Rpt. 1936, pp. 33–35, figs. 2*).—Analyses are noted and discussed.

Apple cider and cider products, J. A. Clague and C. R. Fellers (*Massachusetts Sta. Bul. 336 (1936), pp. 36, figs. 6*).—The authors take up the composition of the more important Massachusetts apple varieties, indicating the nature of the methods of analysis used; blending; pressing; clarification, including the flash heating, the gelatin-tannin, the pectinol, and the centrifugation methods; filtration, including the muslin-tube filter and filter presses and plate filters; preservation of cider, including the germ-proof filtration method, freezing storage, pasteurization, the use of preservatives, and canning; carbonated cider; concentrated cider products; uses of apple pomace; legal aspects of the alcoholic content; the spray residue problem (which is found to be unlikely to assume serious proportions in the case of eastern-grown apples, subject to abundant rainfall); and the nutritive value of cider.

The authors found the gelatin-tannin precipitation to yield a cider having a better body than that obtained by the pectinol treatment. A practical and simple procedure for testing the cider for the quantity of gelatin and tannin needed to clarify it properly is described. Practices of value in other stages of the cider-manufacturing process are also presented.

The preservation of grape juice, III, IV (*Food Res., 1 (1936), Nos. 3, pp. 301–305; 4, pp. 325–335, figs. 3*).—Parts 3 and 4 of this serial contribution (E. S. R., 76, p. 442) from the New York State Experiment Station are given.

III. *Studies on the cool storage of grape juice*, C. S. Pederson.—The author shows that in general the yeasts and bacteria contained in grape juice slowly die out during low temperature storage. "This is gradual, but apparently begins immediately after the low temperature is attained in the juice.

"In spite of the results here obtained, samples of grape juice have fermented in cold storage. It is difficult to account for this fermentation. It may be due to excessive growth of yeast prior to cooling, resulting in fermentation after cooling and before actual death of organisms takes place. Since in examination of a few samples, however, a high count of yeast was usually found, it seems more logical that certain strains become acclimated, grow, and ferment the product.

"Occasionally mold developed in the samples. Mold has been noted on a number of occasions on juice in cold storage, even though the juice has been frozen. It seems that the only safe method of eliminating mold is to exclude air from contact with the juice.

"From the standpoint of the quality of the juice itself, there is little doubt that this method of storage favors the retention of the natural aroma and flavor. It furthermore results in a more rapid precipitation of the argols and in a clearer juice."

IV. *Pasteurization of juices or musts prepared from several varieties of grapes*, C. S. Pederson, E. A. Beavens, and H. E. Goresline.—The authors report upon experiments in which "temperatures attained in the juice were determined by means of thermocouples connected to an electropotentiometric thermometer, and the rate of killing of micro-organisms was determined by platings of the juice during pasteurization at 1-min. intervals.

"In samples of juice prepared from Fredonia, Ontario, Niagara, Elvira, Concord, and Catawba grapes the numbers of living micro-organisms were markedly reduced when a temperature of 62.8° C. (145° F.) was attained, and all micro-organisms were killed by heating to 73.9°. Pasteurization temperatures from 54.4° to 60° reduce the number of micro-organisms present in grape must sufficiently so that a pure-culture inoculum of yeast will ordinarily control the fermentation. Pasteurization at such temperatures is unlikely to produce off-flavors in the must. The numbers of living organisms in juice prepared from California Muscat grapes were markedly reduced at 62.8°, but spore-forming bacteria were still present after the juice was heated to 76.7°. The addition of small quantities of sulfur dioxide lowered the temperature required for killing of organisms but not sufficiently to recommend its use. Stirring of juice is essential to uniform heating. Foam on the surface of the juice serves as a good insulator protecting organisms present in the foam from heat effects."

AGRICULTURAL METEOROLOGY

A brief list of works on meteorology, compiled by R. T. Zoch (*U. S. Mo. Weather Rev., 65 (1937), No. 1, pp. 1-3*).—This is a selected classified list of some of the more important works on meteorology and climatology, including a number which relate more particularly to agricultural meteorology.

United States Meteorological Yearbook, 1935 (*U. S. Met. Yearbook 1935, pp. II+140, figs. 4*).—This yearbook, which was formerly issued as a report of the Chief of the Weather Bureau, contains a general summary of weather conditions in the United States during the year 1935 (E. S. R., 75, pp. 589, 590) and annual meteorological summaries, 1935, which have been previously noted from other sources.

Weather of 1936 in the United States, J. P. Kohler (*U. S. Mo. Weather Rev., 65 (1937), No. 1, pp. 12-16, pls. 2*).—Summarizing briefly the outstanding features of the weather of the year, the author says: "The weather during the year 1936 was characterized by marked extremes in temperature and precipitation. Unparalleled prolonged periods of subzero temperatures obtained in many Western States in the early months of the year followed by unprecedented drought conditions during the summer months."

***Climatological data for the United States by sections*, [January–December 1935]** (*U. S. Dept. Agr., Weather Bur. Climat. Data, 23 (1936), Nos. 1-12, [about 200 pp., 3 pls., 3 figs. each]*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Monthly Weather Review, [January–February 1937] (*U. S. Mo. Weather Rev., 65 (1937), Nos. 1, pp. 42, pls. 13, figs. 6; 2, pp. 43-96, pls. 11, figs. 21*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 1.—A Brief List of Works on Meteorology, compiled by R. T. Zoch (pp. 1-3) (see above): An Observation of Anticrepuscular Rays, by J. G. Albright (p. 3); The Geometrical Theory of Halos, II, by E. W. Woolard (pp. 4-6) (E. S. R., 76, p. 588): Tables for the Computation of Halos, by C. M. Lennahan (pp. 7, 8); Atmospheric Waves on Isentropic Surfaces as Evidenced by Interfrontal Ceiling Oscillations, by W. C. Jacobs (pp. 9-12); and Weather of 1936 in the United States, by J. P. Kohler (pp. 12-16) (see above).

No. 2.—A Semi-quantitative Method of Forecasting Summer Stratus in North American Tropical Maritime Air, by J. J. George and W. M. Bradley (pp. 43–46); Temperature and Rainfall Changes in the United States During the Past 40 Years, by L. F. Page (pp. 46–54); The Geometrical Theory of Halos, III, by E. W. Woolard (pp. 55–57) (*see above*); An Unusual Reflection of Sunlight From Alto-Cumulus Clouds, by G. M. French (pp. 58, 59); and Note on the Hurricane of August 5 to 8, 1936, in Mexican West Coast Waters, by D. Blake (p. 59).

North Carolina rainfall, L. A. Denson (*Jour. Amer. Water Works Assoc., 28 (1936), No. 4, pp. 479–483, figs. 3*).—It is shown that the rainfall of North Carolina varies widely, seasonally and locally. The area of heaviest rainfall is an abrupt slope above 3,000 ft. overlooking portions of Georgia and South Carolina, where it is about 70 to 75 in. annually. In most of the Piedmont and part of the Coastal Plain the rainfall varies from slightly under 45 to about 50 in., while on a part of the lower coast section it is between 50 and 55 in., with a small area near New Bern in which the rainfall is 56 in. Seasonally, the distribution is on the whole favorable to agriculture and water supply. "The rainfall increases as winter comes on and . . . there is a pick-up in ground supply in the dormant season until March. Then there is a drop of 0.75 in. in April or planting time when less rain is needed. From May to July there is an increase through the period of cultivation and July and August have the greatest amounts during development and maturity of crops, finally followed by a decline through autumn when dry weather is needed for harvesting."

Teleconnections of climatic changes in present time, A. Ångström (*Geogr. Ann., 17 (1935), No. 3–4, pp. 242–258, figs. 7; abs. in Geogr. Rev., 26 (1936), No. 4, pp. 688–690*).—On the basis of his own observations and those of others, the author discusses factors that may produce widespread simultaneous climatic fluctuations as follows:

"(1) Changes in the amount of solar energy reaching the earth, resulting from variations in (*a*) amount of radiation reaching the upper surface of the atmosphere (i. e., the solar constant), (*b*) transmission of radiation by the clear atmosphere, and (*c*) mean cloudiness; (2) changes in the atmospheric circulation; [and] (3) changes dependent on phenomena whose influence on weather is still obscure, such as corpuscular radiation from the sun and number of nuclei of condensation." He concludes that "the interaction of the processes of radiation and circulation is so close, and the results of the interaction are so complex, that discovery of the causes of a given climatic fluctuation by empirical analysis is difficult if not impossible. Therefore empirical investigation must be preceded and accompanied by theoretical clarification of the effects of variations in the factors named."

Introductory note on the geological foundations of the soils of India, D. N. Wadia, M. S. Krishnan, and P. N. Mukerjee (*Rec. Geol. Survey India, 68 (1935), No. 4, pp. 363–391, pls. 2; abs. in Geogr. Rev., 26 (1936), No. 4, pp. 686, 687*).—The author attempts to correlate mean annual rainfall and rainy days with certain characteristic soil types in India. He finds that "black soil, the "regur' of Indian terminology . . ., occur[s] where the annual rainfall is between 500 and 800 mm and the rainy days are 30 to 50; it is also found, exceptionally, in the higher Western Deccan in places having 1,000 mm a year and more rainy days than 50." He notes that forest soils of the South Indian plantations form a transition between regur and the laterite, and confirms the generally accepted view that regur and laterite are essentially mature formations and the expression of relief and climate, not geology.

SOILS—FERTILIZERS

[Soil research by the Illinois Station] (*Illinois Sta. Rpt. 1935, pp. 14–39, figs. 7*).—Data are reported on soil fertility as explained by long-time processes, by E. E. DeTurk, R. H. Bray, F. E. Condo, R. E. Grim, and P. F. Kerr; leaching studies in relation to good cropping systems, by DeTurk and J. C. Anderson; variations in soils as complicating land-use problems, by F. C. Bauer, A. L. Lang, L. B. Miller, C. J. Badger, C. H. Farnham, and P. E. Johnson; sound management methods and the net value of land, by Bauer, Lang, and Miller; soybean hay and seed yields sensitive to soil fertility, by Bauer, Lang, et al.; fall cutting reduces soil improvement from sweetclover, by Bauer, Lang, H. J. Snider, and Farnham; manure and lime powerful aids in soil conservation, by Bauer, Lang, et al.; lime-legume treatment may affect phosphorus supply and potassium needs not always met by legume-lime system, both by Bauer and Snider; and balancing plant food insures better yields of corn, by O. H. Sears, L. E. Allison, Bauer, Snider, and DeTurk.

[Soil investigations by the Indiana Station] (*Indiana Sta. Rpt. 1936, pp. 16–18, 62–64, figs. 5*).—This report contains brief summaries of soil work under the following captions: Manure varies in value with the kind of soil on which it is used, importance of phosphate fertilizer on "clay" soils of east-central Indiana, nitrogen top dressing of winter small grains on sandy soils, factors affecting the efficiency of phosphate fertilizers, rock phosphate not a substitute for limestone in producing nonacid-forming fertilizers, relative fertility of surface soils and their subsoils, determination of equivalent acidity and basicity of fertilizers, the available phosphorus and potassium contents of the principal soil types in Indiana, the availability of magnesium in fertilizers, crop responses to fertilizer additions and fertilizer deficiency symptoms, and determination of available potash in commercial fertilizers.

[Soil and fertilizer work by the Tennessee Station] (*Tennessee Sta. Rpt. 1936, pp. 6–8, 13, 14, 27–31, fig. 1*).—This report contains findings on a soil survey of Jefferson County; short methods for determining the fertilizer requirements of a soil; fertilizer experiments, by H. P. Ogden; and on lysimeter studies on magnesium and sulfur as plant nutrients, lime-potash relationships, liming problems, migration of phosphates, recoveries of fertilizer nitrogen, and new phosphates (calcium metaphosphate and a new type of glassy calcium phosphate), all by W. H. MacIntire and W. M. Shaw.

[Soil investigations of the Washington Station] (*Washington Sta. Bul. 342 (1936), pp. 14–19, 65, 66*).—This report contains concise summaries on mineral supplements to manure, the maintenance of organic matter in eastern Washington soils, utilization of fertilizers on representative upland soils in western Washington, and changes occurring in irrigated soils as a result of irrigation, cropping, and fertilizer treatments, all by L. C. Wheeting and S. C. Vandecaveye; composition of grasses and hays as influenced by variation in climate and soil type, by Vandecaveye, L. T. Kardos, and Wheeting; maintenance of organic matter in central Washington, by Wheeting, Vandecaveye, and C. I. Seely; investigations of the effect of accumulations of arsenical sprays in orchard soils to their loss in productivity, by Kardos, Vandecaveye, and C. M. Keaton; and reclamation of saline soils, by C. A. Larson.

The universal soil testing system, M. F. Morgan (*Connecticut [New Haven] Sta. Bul. 392 (1937), pp. 125–159, pls. 8*).—This revision of Bulletin 372 (E. S. R., 73, p. 746) includes a few minor changes and additions in the methods and their interpretation.

Soil colors measured by the disc color analyser, C. F. Shaw (*3 Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 78–81, figs. 4*).—By means

of color disk standards rotated with the sample (which consisted of a thin layer of the soil dried on a small disk of blotting paper) (E. S. R., 67, p. 212), the author of this contribution from the California Experiment Station determined the color composition, in terms of black, white, yellow, and red, of the soils qualitatively designated in soil survey reports, etc., as shades of gray, brown, or red.

"The variation in the composition of the color as shown by these studies makes apparent the need of the establishment of more definite standards for soil colors and for an agreement on the color nomenclature. There is also need for determining the degree of variation in composition permissible within any one color designation. What variation in shade or hue is permissible in a 'brown' soil? When does it become a 'light brown' or a 'reddish brown?' . . . Much time and effort is being devoted to devising and standardizing methods of mechanical analysis. Corresponding efforts may well be applied to the problems of soil color. Not only is there need for comparable color measurements by many soil scientists, but there is also need that samples of the same soil be exchanged and measured in several laboratories to determine the consistence in analytical results and the degree of agreement on color designations. . . .

"Soil colors are distinct and definable. They can be measured and their composition reported in brief and specific terms. Therefore the use of soil color designations can be standardized and established by international agreements."

The mineralogical study of the soils [trans. title], V. Agafonoff (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 74–78, figs. 2*).—The author calls attention to the importance of two methods of mineralogical soil study, namely, the microscopic examination of thin layers specially prepared for this purpose and the study, by means of thermocouples placed in a soil sample electrically heated in a silica tube, of the endothermic and exothermic breaks in the temperature curve produced when the sample is heated evenly to 1,000° C. The inflections in the heating curves are attributed to the driving out of water and to decompositions and transformations of the mineral components of the soil. Kaolinite, for example, together with mixtures containing 50 percent or more of this mineral, showed a definite exothermic inflection of the heating curve at a temperature between 900° and 950°. With 10 percent of kaolinite in the mixture the inflection is shown as still clearly detectable, but at 5 percent the effect upon the form of the curve is very slight in the figures presented.

The chemical composition and crystal structure of clay minerals, C. E. Marshall (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 95–97*).—The author discusses the clay minerals from the point of view of certain discrepancies between formulas based on chemical analyses and formulas derived from X-ray data. It is noted that "in the kaolinite-halloysite group of clays the chemical formulas and the X-ray structures are in good accord. The structures are layer lattices composed of $Al_2(OH)_6$ sheets alternating with $Si_2O_3(OH)_2$ sheets. In halloysite these are simply stacked together, giving the formula $Al_2O_3 \cdot 2SiO_2 \cdot 4H_2O$. In kaolinite and dickite, and probably also in nacrite, water is eliminated between OH groups of adjacent layers, giving a closer approach of the Si and Al atoms. The three isomers differ in the geometrical positions in which the layers are stacked above one another, and all have a reasonably constant formula $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$. In this group, therefore, which is composed of clays having little base-exchange capacity, the X-ray and chemical formulas are in perfect agreement."

In the case of beidellite and montmorillonite, formulated, respectively, as $Al_2O_3 \cdot 3SiO_2 \cdot nH_2O$ and $MgO \cdot Al_2O_3 \cdot 5SiO_2 \cdot nH_2O$ the X-ray photograph was the same for each mineral and indicated a structure of the form $Al_2O_3 \cdot 4SiO_2 \cdot nH_2O$. "In attempting to resolve these differences it was necessary to proceed very cautiously and to go right back to the actual analyses on which the chemical formulas were based. Since it was quite clear that the clays are built up of the layer lattice units which have already been described, the analyses were recalculated so that they could be compared with various lattice types consisting of different numbers of Al and Si layers. The following replacements were then assumed to operate in order to complete the lattice framework. Aluminum was assumed to replace silicon as in the micas and feldspars. Magnesium was assumed to replace aluminum as in talc and the chlorites. Each of these replacements demands one equivalent of a cation in order to balance the resultant charge on the framework. In addition ferric iron was assumed to replace aluminum. In this way the published analyses of montmorillonites, beidellites, and nontronites were compared with the ideal lattice types. It was found that although a single analysis might be represented equally well by two different lattice types there was only one type which fitted all the montmorillonite and all the beidellite analyses. This was the type $Al_2O_3 \cdot 4SiO_2 \cdot nH_2O$, corresponding to two Si layers for each Al layer. In the beidellites the predominant replacement was that of Al for Si. In the montmorillonites there was generally a predominant replace of Mg for Al, but it was usually accompanied by a considerable replacement of Al for Si. In both cases Fe could replace Al, and this replacement carried to completion leads eventually to nontronite. Certain other nontronites show compositions suggesting that they are derived from the halloysite type rather than from the beidellite type. Finally, when the clay subfractions which have been intensively studied in this laboratory were analyzed, it was realized that two other substitutions in the lattice were probable, namely, that of phosphorus for silicon and that of tetravalent titanium for aluminum. The importance of the former needs no emphasis."

Briefly considering the base-exchange mechanism in the light of the observations mentioned above, the author finds that "a small fraction only of the exchange capacity is due to the cations in the electrical double layer surrounding the particles." He also shows that the new information necessitates modifications in some of the current views of the relation between base-exchange capacity and the silica : sesquioxide ratio.

On the state of the clay substances of the oxyphilic volcanic ash soils [trans. title], M. SHIOIRI (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 70–73*).—The isoelectric point of the argillaceous material of the lower layer, poor in humus, of the oxyphilic volcanic ash soils studied was found to lie close to pH 7. In the upper layers, relatively rich in humus, the isoelectric point was found at somewhat lower pH values. After such soil had been held in a moist state the electrical charge of the clay substances when dispersed in water was positive, whereas, at least in the upper layer, the undisturbed soil in its natural state showed either no charge or a weak negative charge. This is taken to indicate that in their natural state these soils are practically isoelectric with the soil water and have attained a stable condition.

Hydration of minerals and soil colloids in relation to crystal structure, W. P. KELLEY, H. JENNY, and S. M. BROWN (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 84–87, figs. 4*).—The authors report from the California Experiment Station a comparative study of dehydration curves of

ground minerals and soil colloids. The substances were brought to equilibrium with water vapor over 50 percent sulfuric acid, and subsequently the water loss was measured at various temperatures up to 800° C. They discuss the bearing of the results obtained upon questions of crystal lattice structure and of forms of adsorbed water in the individual minerals examined and of the nature of soil colloid structure.

With regard to adsorbed water, it is pointed out that "if one sets all adsorbed water equal to 100 percent and then plots the relative water losses against temperature, one finds differently shaped curves which point to the existence of various forms of adsorbed water. Feldspars lose their adsorbed water at a relatively constant but low rate, while bentonites give off over 80 percent of their hydration water below 100° or 150°. Feldspar water is held tightly, whereas bentonite water is loosely bound. The authors believe that on feldspars the adsorbed water molecules are attracted by the free electric fields of exposed O^{--}, Al^{+++}, and Si^{++++} ions, and they designate this form of adsorbed water as broken bond water. In the case of bentonites and related minerals the neutral O^{--} and OH^- planes are also able to polarize water molecules, but only by weak electric stray forces, and consequently the molecules escape at very low temperatures. This type of adsorbed water is termed planar water. At the edges of the planes broken bond water also occurs. In any mineral consisting of O and OH sheets the relative proportion of the two types of water depends on the extent of the exposed planes as compared with that of the areas vertical to them."

The curves plotted for the soil colloids investigated "suggest that the soil colloids are of platy nature and are composed of O^{--} and OH^- planes. The number and arrangement of the planes within the particles appear to differ in certain respects from those of known minerals. However, the nature of the exposed surfaces of the soil colloids greatly resembles those of bentonite and beidellite."

The evidence as to the crystallinity of soil colloids, W. P. Kelley (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 88–91*).—In support of the view that the soil colloids are of a microcrystalline structure, the author of this contribution from the California Experiment Station cites in brief summaries the X-ray evidence, the indications found in optical properties of all the soil colloids thus far examined, the effects upon the X-ray spectrographs produced by grinding soil colloids, and the results of dehydration studies, including the effect of dehydration upon the X-ray spectrographic picture. All of these various lines of attack upon the problem yielded evidence indicative of crystalline structure.

The significance of crystallinity in relation to base exchange, W. P. Kelley (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 92–95*).—In part from the data discussed in the paper above noted, the author of this contribution from the California Experiment Station concludes that "the exchange capacity of a soil colloid depends on two variables, first, the kind of exposed surfaces on its individual particles, second, the amount of surface. The kind of surface is determined by the crystal structure and therefore the kind of mineral that we are dealing with. The amount of surface depends on the particle size."

On the formation of structure in soil.—III, Mechanism of the swelling of soil, D. I. Sideri (*Soil Sci., 43 (1937), No. 1, pp. 43–49, pl. 1*).—Continuing the experiments of a series recently noted (E. S. R., 77, p. 16), the author finds that "water absorption and swelling of soil are determined by the structure of the surface layer of oriented particles.

"Particular importance is attached, in the case of unstable groupings, to the compactness of the particles at the interface solid phase-air. Mechanical damaging of the surface layer leads to disintegration. From the viewpoint of the new conceptions concerning soil structure it becomes necessary to revise the theory of soil morphology. There is no other field . . . in which the internal relation between the shape of the molecule and the crystal would appear with such clearness as in the mesomorphous state."

Ionic exchange and structure [trans. title], G. Wiegner (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 5–28, figs. 6*).—A large part of this paper is given over to a historical review of the development of the theory of the structure and formation of the colloidal micelle. Some new experimental matter is also dealt with.

It is shown that a difference between the surface structures of the outer and inner exchange layers may lead to the setting up of a different metastable structural equilibrium at each layer. The exchange occurring in complexes of the same analytical composition may lead to very different results if the exchange ions are attached to different parts of the surface layer.

The types of alkali soils (Solonetz) [trans. title], V. A. Kowda (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 99–102*).—The author distinguishes five classes of "alkali" soils which he gives the respective designations Solonchak-like Solonetz, residual Solonetz resembling Solonchak, gypsum-free alkali Solonetz, soda Solonetz, and soda Solonetz-Solonchak. These forms of alkali soil are, in the order in which they are named, the successive stages of development. In the description of the series the bases of distinction between the successive stages are emphasized.

Cellulose decomposition in acid soils, H. Karnicka and J. Ziemięcka (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 109–111*).—The authors here summarize an investigation of which the results are to be more fully presented elsewhere. They have found, in part, that "two main groups of micro-organisms seem to be specially adapted in our soils to aerobic cellulose decomposition, namely, molds and bacteria. Actinomycetes have been found, however, to develop well as secondary agents in cellulose decomposition. Their role in this process still needs a special study. The direct action of bacteria on cellulose in the soils seems to be limited to the base-saturated soils. At a pH higher than 6.5, bacteria were almost the only agents of cellulose destruction. In slightly acid soils, or at a pH of 6.0–6.5, the cellulose was attacked by bacteria, by molds, and by some actinomycetes. In soils poor in humus and with a pH less than 6.0 no growth of specific cellulose bacteria was ever found, and actinomycetes have been noted only occasionally. In such soils the cellulose was decomposed by molds. . . . Lime was found in the above soils to be a negative factor in cellulose destruction, as no cellulose bacteria ever appeared, and the activity of the molds suffered from this treatment. Nitrogen was the essential positive factor both for the density of the specific mold population and for its activity in the soil. A close correlation was found to exist between the ability of cellulose decomposition in the soils and their average cereal crops, except in the case of soils treated with both lime and nitrogen. . . .

"The rate of cellulose decomposition in the acid or 'mold soils' that were studied increased nearly to 100 percent with the addition of minerals and nitrogen in the absence of liming, but it never reached the level of cellulose destruction which was found in base-saturated, neutral soils. These 'bacteria soils' contained a very rich population of cellulose bacteria (*Spirochaeta cytophaga* and others) and were found to destroy nearly twice as much cellulose, in the given unit of time, as did the most fertile plats from the acid

field. . . . In base-saturated, neutral soils molds and actinomycetes developed only after the first attack of bacteria on cellulose, and the tertiary microbial growth consisted, just as in acid soils, of weakly staining thin rods and cocci feeding on the decaying organisms. A rich protozoan growth took place very often in these soils."

Broad relationships between micro-organisms and soil fertility, J. G. Lipman (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 29–44, fig. 1*).—Recent progress in soil microbiology is here reviewed, with citations of more than 130 papers, by the director of the New Jersey Experiment Stations. The discussion takes up some of the recent observations concerning soil micro-organisms, methods, environmental conditions (including temperature, the nature and concentration of the salts present, moisture, reaction, aeration, and organic matter), and interrelations between higher plants and micro-organisms (including antibiotic phenomena, associations of legumes and nonleguminous plants, and plant stimulants and accessory food substances).

Does photo-nitrification occur in soils? N. V. Joshi and S. C. Biswas (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, p. 104*).—The authors report very briefly upon experiments on the formation of nitrates from ammoniacal compounds and of ammonium compounds from nitrogenous organic substances. The soils tested were an acid soil from Dacca and a calcareous soil from Pusa. Attempts to find indications of photonitrification in culture solutions were also carried out. "In none of these soils after sterilization could we obtain nitrate formation from the added ammonium salts or from urea or farmyard manure, even after long exposure of the soils to sunlight. Soils without sterilization, with their nitrifying flora alive, did not show any increased nitrate formation by exposure to sunlight. On the other hand, there was depression in nitrate formation in soils exposed to sunlight. This depression is surmised to be chiefly due to the lowering of the activity of the nitrifying organisms, caused by raising of the temperature of the soil on account of exposure to the sun's rays." Peptone and urea culture solutions also failed to show any photoammonification.

"It appears, therefore, that the hypothesis of photonitrification is not proved, and that any expectations that might have been aroused of putting it to practical use in reclaiming infertile soils by stimulating such soils by exposure to sunlight are unlikely to be realized."

The formation of nitrite by heterotrophic bacteria from soil, L. M. Crump (*3. Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 103, 104*).—The author finds that "there are a relatively large number of heterotrophic soil bacteria which under very varied conditions produce nitrite in small amounts from ammonia. These forms require organic matter for their satisfactory growth and carry out their chemical transformations at pH values anywhere between 5.0 and 8.0. As yet there is no evidence of different morphological stages in the course of the life cycle, and the great majority are short rods or cocci. There is also no indication that in any other respect do they fall into any one physiological grouping. To some extent a correlation can be traced between the increase in their numbers in a culture and the increase of nitrite, but this breaks down in the case of those organisms that utilize nitrite in the course of growth."

Soils of Cascade County: Soil reconnoissance of Montana.—Preliminary report, L. F. Gieseker (*Montana Sta. Bul. 337 (1937), pp. 66, fig. 1, maps 4*).—The county covered by this reconnaissance survey occupies 2,747 sq. miles in central Montana. Its lands form, for the most part, a transitional area between mountain groups and rolling drift-covered plains.

In the survey here noted, the soils found were classified as 45 types assigned to 25 series. The Morton silt loams were found to cover 9.6 percent of the area surveyed, the Teton stony loams 9.4 percent. Mountains occupy 25.6 percent.

Methods of conserving Michigan muck soils, P. M. Harmer (*Michigan Sta. Quart. Bul., 19 (1937), No. 3, pp. 182–191, figs. 8*).—The author finds that muck soils, as usually used, are likely to be short lived by reason of "three agents of destruction—(1) excessive chemical decomposition, (2) fire, and (3) wind.

"Practical methods of restoration of depleted mucks and of prevention of future depletion include (1) maintenance of as high a water level in the soil as the root systems of the crops being grown will permit, (2) use of windbreaks and interplanted grain for wind protection, (3) use of organic matter in form of manure or green manure for wind protection and soil improvement, (4) heavy compaction of excessively drained soils, (5) addition of various plant food materials which may have been largely removed by wind erosion and cropping methods."

Measures (1) and (4) are directed against excessive aeration and the concomitant oxidation of the organic components of muck soils.

Soils in relation to fruit growing in New York.—X, Susceptibility of various New York orchard soils to reduction upon water-logging, M. Peech and D. Boynton (*[New York] Cornell Sta. Bul. 667 (1937), pp. 20, figs. 4*).—The authors here record an extension of work previously noted (E. S. R., 76, p. 302), endeavoring to determine the cause of some of the discrepancies between the redox potentials of soils as measured in 0.1 N H_2SO_4 suspensions and their drainage conditions.

"It was found that manganese concretions which are likely to be present in soils subject to waterlogging introduce an inherent error in this method. The oxidation of ferrous sulfate by manganese concretions proceeded very rapidly. Even an immediate measurement of the redox potential of a reduced soil containing active forms of manganese concretions did not eliminate this error.

"The effect of time of suspension in acid upon the final value of the redox potential was investigated also. As might be expected, the reduced soils showed a greater increase in Eh with time than did the well-oxidized samples of the same soils."

The redox potentials of some orchard soils in situ and in 0.1 N H_2SO_4 suspensions of these soils were measured frequently during a 30-day period. "The redox potentials measured in situ in many cases showed higher intensity of reduction in subsoils than in corresponding surface samples during the early stages of the experiment. In a few soils, potentials as low as that of the hydrogen electrode were developed within a few hours after waterlogging. At the end of the experiment, most of the surface soils had lower redox potentials than had the corresponding subsoils. Well-drained types of subsoils were as susceptible to reduction upon waterlogging as were poorly drained types. In general, subsoils of light texture, which had wider C:N ratios, were more susceptible to reduction than were heavy subsoils, which had narrower C:N ratios."

Means for the determination of the mode of action of drainage systems. canals, and tile drains [trans. title], E. Diserens (*3 Internatl. Cong. Soil Sci., Oxford, Eng., 1935, Trans., vol. 3, pp. 45–69, figs. 7*).—The author points out various ways in which drainage works, both canals and tile, influence the circulation of water in the soil, the aeration, the temperature, the permeability,

condensation and evaporation, and the capacity of the soil to absorb fertilizers. Of these effects, that exerted upon the movement of water in the soil is emphasized as of outstanding importance to the proper operation of drainage systems. The general term "permeability" is held to cover two distinct characteristics or constants of the soil, both readily subjected to accurate measurement, namely, rapidity of filtration and permeability proper. It is further pointed out that, except in the case of sands which have no structure, there are differences between laboratory and field data representing the constants named, so that these constants, to be used as a guide in connection with drainage and irrigation works, should be determined in the field.

Other physical characteristics of soils are also discussed with respect to their relation to drainage systems and the effects of such works upon soils.

One of the points emphasized is that soil drainage systems are to be recommended not merely in regions of high or moderate humidity but also in areas where soils of little permeability are used under irrigation.

[Erosion studies by the Washington Station], G. M. HORNER and P. C. MCGREW (*Washington Sta. Bul. 342 (1936), pp. 69–71*).—Progress results are briefly reported of investigations on effect of plant cover on run-off and erosion, movement and balance of soil moisture, tillage and cultivation practices for erosion control, cropping practices in relation to erosion control, terracing, gully control, tree planting for erosion control, and wind erosion.

Handbook of erosion control engineering on the national forests, E. W. KRAMER, A. L. ANDERSON, and M. B. ARTHUR (*U. S. Dept. Agr., Forest Serv., 1936, pp. VI+90, figs. 72*).—The purpose of this handbook is to serve as a guide in carrying on erosion control work in the national forests. It emphasizes the control measures which apply to comparatively undeveloped or forested types of land rather than those for agricultural or cultivated areas. The greater part of the handbook deals with the design and construction of engineering structures which have proved practicable for erosion control work, and with the considerations which affect the choice and use of these structures. It contains chapters on the erosion problem on national forests, erosion control measures, hydraulics of erosion control, gully structures, estimated cost of restoring a gully, soil saving and debris dams, and miscellaneous structures.

Preventing soil blowing on the southern Great Plains, E. F. CHILCOTT (*U. S. Dept. Agr., Farmers' Bul. 1771 (1937), pp. [2]+29, figs. 21*).—Tillage practices and implements used for the prevention of soil blowing are described, together with cropping practices.

Fertilizer analyses for different North Carolina crops, including the best percentages of water-insoluble nitrogen of totals in fertilizer mixtures recommended (*North Carolina Sta. Agron. Inform. Circ. 107 (1937), pp. 12*).—Formulas of fertilizer mixtures and recommended quantities of these fertilizers are given for various crops and groups of crops grown on the several soils of the State.

Liming Coastal Plain soils, J. B. HESTER, M. M. PARKER, and H. H. ZIMMERLEY (*Virginia Truck Sta. Bul. 91 (1936), pp. 1303–1358, figs. 14*).—Part 1 of this bulletin deals with the yields of certain crops when grown on specific types of soils with a known reaction. Based on these yields, general recommendations are made concerning the optimum soil reaction range to be maintained. "It is realized that due to the great variation in soils no two of them are apt to produce identical results from any given treatment, but in general these recommendations, if modified when necessary, should be applicable."

Part 2 "deals with a more or less technical discussion of the various aspects of liming the soil."

Effect of calcium cyanamide on the soil microflora with special reference to certain plant parasites, C. M. HAENSELER and T. R. MOYER (*Soil Sci., 43 (1937), No. 2, pp. 133–151, pl. 1*).—In the greenhouse pot experiments reported in the present contribution from the New Jersey Experiment Stations, calcium cyanamide applied to the soil in quantities as large as 10,000 lb. per acre caused a marked change in the number of fungi, bacteria, and actinomyces as determined by the plating method. A greater decrease in the number of fungi resulted in soils near the neutral point in reaction than in more acid soils. After calcium cyanamide was applied to the soil, the number of bacteria and actinomyces decreased temporarily, then increased very rapidly for about 30 days, after which they again decreased to the normal. In one case the number of bacteria in the treated soil was 92 times the number in the untreated soil. "The effect of calcium cyanamide on the soil microflora seemed to be more closely correlated with the soil reaction than with the quantity of material used."

The effect of calcium cyanamide in controlling certain soil-inhabiting plant pathogens was also studied. This fertilizer was very effective as a control for some organisms. In soil infected with *Plasmodiophora brassicae*, for example, "in greenhouse tests calcium cyanamide was about two and one-half times as effective as an equal quantity of hydrated lime in controlling clubroot infection shortly after application."

Toxicity of arsenic, borax, chlorate, and their combinations in three California soils, A. S. CRAFTS and C. W. CLEARY (*Hilgardia [California Sta.], 10 (1936), No. 10, pp. 399–413, figs. 3*).—In the greenhouse experiments described, sodium arsenite, hydrous sodium tetraborate, and sodium chlorate were used singly and in combination in concentrations which reduced the growth of indicator plants to 50 percent and to 10 percent of the normal.

"Arsenic and borax showed antagonistic reaction in Yolo clay loam at both the 50 percent and the 10 percent growth levels. Arsenic and borax toxicities were additive in Fresno sandy loam and Stockton adobe clay. Arsenic and chlorate toxicities were additive in all three soils at both growth levels. Borax and chlorate showed antagonistic reactions in all three soils at both growth levels.

"The combination of the chemicals used three at a time are of only theoretical interest and provide no practical information. In the practical application of these chemicals the arsenic-borax combination would find little use. Sodium chlorate and white arsenic applied dry form a very useful mixture for soil sterilization. As shown by the greenhouse experiments, there is no indication of loss by antagonism in their reactions. In the use of borax and sodium chlorate in combination for soil sterilization the antagonism in their action can be reduced to a minimum by using the lowest effective dosage of chlorate and adding enough borax to complete the destruction of the vegetation. The borax-chlorate combination for soil sterilization has the advantage of being practically nonpoisonous, and the use of the borax, besides reducing the fire hazard of the chlorate to a low level, provides a residual effect that lowers the probability of reinfestation by seedlings."

Some effects of thallium sulfate upon soils, A. S. CRAFTS (*Hilgardia [California Sta.], 10 (1936), No. 10, pp. 375–398, fig. 1*).—Experiments indicate that thallium sulfate is very toxic in soils. Toxicity decreases, however, with time and cropping, and varies with soil type, a range of three times or more having been shown in the soils studied. The toxicity is greater in soils low in fertility, but cannot be correlated with the soil type nor with water-holding capacity.

"Thallium sulfate was strongly fixed in four soils. The saturation capacity of Yolo clay loam for this chemical was about 10,000 p. p. m. on a dry-weight basis. Leaching with as much as 200 cm of distilled water had practically *no effect upon the thallium toxicity in these soils.*

"Thallium-treated barley, as commonly used for squirrel bait, had little or no effect upon germination or growth *of oats planted in the same can and* spaced within 0.5 cm of the grains. Growth was reduced when the spacing was 0.25 cm. Thallium-treated whole barley gave a 50 percent germination, and the fresh weight of the seedlings at 30 days was 47 percent of that of the checks. Oat seedlings were unaffected by the application of treated barley to the soil, followed by irrigation, except where the dose was excessive. Thallium-treated barley also had little effect upon growing plants in a pasture area. The heaviest application, equivalent to over 2,500 lb. of grain to the acre, reduced the growth less than 50 percent. . . .

"About 30 lb. of thallium sulfate uniformly distributed would be required to sterilize an acre-inch of soil. Under natural conditions of application it would probably be tied up in a much shallower layer of soil. At least 5,000 lb. of squirrel bait, carrying 1 percent of Tl_2SO_4 uniformly distributed, would be necessary to sterilize an acre completely. . . . In actual field practice, dosage seldom exceeds 1 lb. of thallium-treated grain per acre, bearing 0.01 lb. of Tl_2SO_4. *Dosage rapidly decreases as the rodents are brought under control.* The differences between these rates of dosage and those mentioned above show *that little need be feared from the sterilization of soils by thallium-treated* squirrel bait."

AGRICULTURAL BOTANY

The soil-block washing method in quantitative root study, T. K. Pavlychenko (*Canad. Jour. Res., 15 (1937), No. 2, Sect. C, pp. 33–57, figs. 10*).—"It has been observed consistently that competition among plants first takes place between the root systems, and that the nature, vigor, extent, and distribution of the root systems have an important bearing on the development of top growth. A new technic for root studies, the soil-block washing method, is described in considerable detail. This method enables the investigator to procure entire root systems at any stage of plant development from plants grown under natural soil conditions."

Frost-hardening studies with living cells, I, II, J. Levitt and G. W. Scarth (*Canad. Jour. Res., 14 (1936), No. 7, Sect. C, pp. 267–284, figs. 3; No. 8, Sect. C, pp. 285–305, figs. 4*).—The following two papers are included:

I. *Osmotic and bound water changes in relation to frost resistance and the seasonal cycle.*—"The osmotic pressure and nonsolvent space of the cells of various types of plant were estimated by the plasmolytic method and related to frost resistance and the seasonal cycle. *Osmotic pressure always rises* with hardening and falls with dehardening, and it generally reaches higher values or begins to rise earlier in the hardier species and varieties. The effect of osmotic pressure in reducing the amount of ice formation is enhanced in woody plants by the condition that only about half the cell volume is occupied by the osmotically active solution. The remainder, i. e., the nonsolvent space, is shown to consist partly of bound water and must therefore represent hydrophilic colloid. This occupies an even larger proportion of the sap vacuole than of the protoplasm, and it increases notably with hardening. This change, besides reducing intercellular ice, is regarded as protecting the most vulnerable part of the cell, viz, the vacuole, from being frozen at very low temperatures."

II. *Permeability in relation to frost resistance and the seasonal cycle.*—"Cell permeability as estimated by the plasmolytic method in various types of plants and for different classes of solute has been studied in relation to frost resistance and the seasonal cycle. Permeability is found to increase greatly with hardening, whether induced by low temperature or other conditions, and it seems to parallel closely the seasonal changes in frost resistance. As regards different species and varieties, cell permeability in the hardened state shows better correlation than any other character with ability to resist frost. The permeability change is greatest toward potassium nitrate—at least in cells (viz, those of hardy woody plants) that are definitely permeable to the salt; the change is more moderate toward polar nonelectrolytes with small molecules, such as urea, but with these it occurs in all plants capable of hardening; toward apolar substances, such as urethane, there is no change. These relations point to a widening of the aqueous pores or increased hydration of the plasma membrane as the mechanism of the permeability increase. Hypotheses are put forward as to the means by which freer permeability to water may increase resistance to certain types of mechanical injury by frost."

The frost-hardening mechanism of plant cells, [III], G. W. Scarth and J. Levitt (*Plant Physiol., 12 (1937), No. 1, pp. 51–78, figs. 3*).—Continuing this series of studies, the linked series of changes associated with hardiness as described are summarized as follows:

"Complicated hydrolytic breakdown of carbohydrates increases the osmotic pressure of the cell and also in the hardier plants and nonsolvent space in the vacuole at the expense of starch and perhaps of other reserves held in the cytoplasm. Due to similar changes in the protoplasmic colloids, the whole cytoplasm, probably, and the plasmic membranes almost certainly, become more hydrated. As a consequence of this change, the viscosity of the protoplasm is lowered. Because of the change in the membranes in particular, cell permeability is increased. If all of these changes are causally connected one with another, the correlation of each and all of them with frost resistance would be found, though only one might play a part in it."

The authors present theories as to the possible role of each but feel that a satisfactory demonstration requires more knowledge of the mechanisms both of injury and of resistance than is yet available.

A bibliography of 48 references is given.

Ontogeny and structure of collenchyma and of vascular tissues in celery petioles, K. Esau (*Hilgardia [California Sta.], 10 (1936), No. 11, pp. 429–476, pls. 8, figs. 8*).—Celery petioles were found to contain a semicircle of large collateral vascular bundles on the abaxial and a row of very small bundles on the adaxial side. A subepidermal collenchyma strand occurs in the rib opposite each major vascular bundle on the abaxial side. The collenchyma and the large vascular bundles make up the "celery strings." The petiole of a primordial leaf contains the protoderm, procambium, and ground meristem, and the development of these meristems is described in detail.

The vascular bundles usually contain only primary tissues, although the cambium differentiates the xylem from the phloem in old leaves. The protoxylem is endarch and is made up of spiral vessels and parenchyma. The metaxylem vessels have scalariform and reticular thickenings. No fibers occur in the xylem. The phloem contains sieve tubes, companion cells, and phloem-parenchyma cells. Slime bodies occur in each element of the differentiating sieve tubes, and mature sieve tubes possess no nuclei but contain cytoplasm and plastids. A single sieve plate occurs on the end wall. The sieve tubes and companion cells develop in rapid succession, the old elements being oblit-

erated. Phloem parenchyma cells of the old phloem continue to enlarge for some time and develop thick primary walls constituting, when fully developed, the bundle cap.

When collenchyma is initiated in the ground meristem, the divisions occur in rapid succession, new cells remaining small and closely packed. The wall thickenings appear long before cell elongation ceases. Mature collenchyma cells are prosenchymatous in nature—long, with tapering ends. The collenchyma is mechanically much stronger than the vascular tissue. Its breaking load may be from two to four times that of the entire vascular bundles or the bundle cap.

Vessel development in celery, K. ESAU (*Hilgardia* [*California Sta.*], *10* (*1936*), *No. 11, pp. 477–488, pls. 4, fig. 1*).—"The primary vessels in celery show intact end walls until the elements are almost mature. These walls show a peculiar lenticular thickening in the region that later becomes the perforation. Secondary thickenings are formed on longitudinal walls and usually also on the margins of the end wall around the lenticular thickening, leaving the latter exposed. When the end wall breaks down, the lenticular thickening disappears gradually, as though dissolved. This change occurs after the secondary thickenings have been deposited. The protoplast disintegrates at the same time."

Development of the flower and macrogametophyte of Allium cepa, H. A. JONES and S. L. EMSWELLER (*Hilgardia* [*California Sta.*], *10* (*1936*), *No. 11, pp. 415–428, pls. 4, figs. 5*).—"The outer perianth whorl and the outer stamen whorl are the first floral organs to differentiate in the onion. These are followed by the inner perianth whorl and inner stamens, and lastly by the carpels. The outer perianth segments and their subtended anthers usually arise counterclockwise. The sequence of development of the members of the inner whorls of perianth and anthers is usually clockwise. The first segments of the inner whorls usually arise between the oldest and second oldest segments of the outer whorls. The embryo sac is formed from the chalazal daughter cell. One of the synergids is distinctly hypertrophied; both appear to be well supplied with reserve food."

Hydration studies in fresh and dried red clover roots and shoots with reference to physical properties and chemical composition of tissue, G. A. GREATHOUSE and N. W. STUART (*Plant Physiol.*, *11* (*1936*), *No. 4, pp. 873–880, figs. 3*).—In this study by the University of Maryland, the Ohio and French varieties of red clover were differentiated as to cold hardiness by the unfreezable water of the fresh tissue or the rehydration of the dried tissue. The internal factors influencing the hydration capacity appear to differ for root and shoot tissues. The readily available carbohydrates seem to be most important in favoring a greater hydration capacity. The total pectin and total pentosans were not related to the hydration capacity of the root and shoot tissues. The protein nitrogen was usually higher in tissues with lower hydration capacity, and, similarly, the nonprotein nitrogen curves failed to follow the hydration capacity curves. No consistent relation appeared between the total water content of the roots and shoots and the hydration measurements.

The hydration capacity of red clover tissue is influenced by the chemical composition as well as by the organization of living matter.

The dependence of carbon dioxide assimilation in a higher plant on wave length of radiation, W. H. HOOVER (*Smithsn. Misc. Collect.*, *95* (*1937*), *No. 21, pp. 13, pls. 3, figs. 4*).—"The rate of photosynthesis on the basis of equal incident energy was determined as a function of the wave length of light for a wheat plant. The entire visible spectrum is effective in producing photosynthesis. The wave length limits, although not accurately determined, appear to be

between 7,200 a. u. and 7,500 a. u. on the red end, and less than 3,650 a. u. on the blue end of the spectrum. A principal maximum occurs at 6,550 a. u. in the red, and a secondary one at 4,400 a. u. in the blue. Increased reflection and transmission of radiation in the green region by plant leaves diminish the effectiveness of incident green rays to promote photosynthesis."

Photoperiodic response of certain long and short day plants to filtered radiation applied as a supplement to daylight, R. B. WITHROW and J. P. BIEBEL (*Plant Physiol., 11 (1936), No. 4, pp. 807–819, figs. 10*).—This contribution from the Indiana Experiment Station reports the results of a study of the effects of three bands of radiation, used to prolong normal winter days to 18 hr., on the photoperiodic responses of three long-day plants (*Callistephus chinensis, Helianthus cucumerifolius,* and *Scabiosa atropurpurea*), and three short-day plants (*Salvia splendens, Cosmos bipinnatus,* and *Tithonia speciosa*). The wave bands included red (650–1,400 mμ), green (455–550 mμ), and blue (380–510 mμ). The results and conclusions are given in detail.

The long-day plants bloomed early under days prolonged with red and white radiation. Aster, seeded in winter, produced higher dry weights (tops and total) under the red. The blue induced earlier flowering in aster and sunflower, but not in *Scabiosa*. Aster and sunflower failed to flower as quickly under green and control conditions as under the red. *Scabiosa* had not bloomed under the blue, green, or control conditions by late spring. The three short-day plants remained in the vegetative condition when the days were lengthened by red and white radiation, but flowered in short days and days lengthened by blue and green light. Red light caused a decrease in synthesized dry matter.

Aster, seeded in the fall (12½-hr. day), failed to respond reproductively when the days were lengthened as designated, and the plants in all the plats bloomed about the same time. When germinated in a shorter day (9½ hr.), the response was as indicated above. *Salvia* from clonal cuttings, with all plants in flower when placed under days lengthened by wave bands as indicated, reverted to the vegetative state under red and white light but remained in the flowering condition under the other treatments. Corn, producing carpellate flowers in the tassel under short days, was prevented from producing such inflorescences by the red and white light used to prolong the day, but not by the blue or green.

It is concluded that, under the conditions imposed, red radiation is most effective in producing the photoperiodic response, both in short- and long-day plants; that some especially sensitive plants (e. g., aster) respond to the blue light; and that green radiation has little effect when used to prolong the day.

Effect of light on solanine synthesis in the potato tuber, H. W. CONNER (*Plant Physiol., 12 (1937), No. 1, pp. 79–98, figs. 6*).—"A new analytical method has been developed for the quantitative estimation of solanine in the presence of solanidine, based upon the amounts of sugars set free on acid hydrolysis. Upon irradiation by a mercury arc in Uviol or by Mazda lamps, potato tubers increased in solanine. This was accompanied by the appearance of anthocyanin in the sprouts. Wave lengths which are efficient for glucose synthesis did not induce a significant increase in solanine, but did result in an increase of chlorophyll. Ultraviolet rays of about 0.3μ are effective for solanine formation but not for chlorophyll elaboration."

The bibliography contains 51 references.

The quantitative mineral nutrient requirements of plants, P. MACY (*Plant Physiol., 11 (1936), No. 4, pp. 749–764, figs. 5*).—Based on a review of the literature and on the author's experiments with barley, "a theory of the relation-

ship between the sufficiency of a nutrient and its percentage content in the plant is proposed as a measure of the quantitative mineral nutrient requirements of plants. The central concept is a critical percentage of each nutrient in each kind of plant, above which there is luxury consumption, and below which there is poverty adjustment, which is almost proportional to the deficiency until a minimum percentage is reached. . . . It is proposed that the critical nutrient composition of a plant is an 'ideal' but inherent characteristic of the plant, the critical and minimum percentages varying only under special conditions. The critical percentages are believed to be intimately connected with the relationship between vegetation and reproduction. It is shown that the Mitscherlich law of the minimum holds only during poverty adjustment, while the Liebig law of the minimum holds over the rest of the yield curve.

"It is proposed that the use of the theory to determine fertilizer needs of particular crops on particular soils under the particular local conditions may meet the need for a convenient method as reliable as field plat tests."

Effects of phosphorus and lime in reducing aluminum toxicity of acid soils, K. E. Wright (*Plant Physiol.*, *12* (*1937*), *No. 1*, *pp. 173–181*).—In preliminary tests with beets at the Rhode Island Experiment Station, it was found that by the use of calcium lactate the role of calcium as an essential element could be compared with its role in reducing acidity. Healthy, vigorous plants were obtained with lime and superphosphate and very poor plants in untreated acid soil, while those with calcium lactate were intermediate in development between the two extremes. Analyses of these plants indicated that (1) pH, as such, was not a limiting factor, (2) calcium deficiency or (3) photosynthesis could not be considered limiting growth factors, while (4) deficiencies in total nitrogen, nitrates, and phosphorus in the plants from the acid soil revealed possible causes of the retarded growth therein. Further tests, using drip cultures, indicated phosphorus deficiency to be the possible cause of retarded growth, and aluminum as the probable cause of this deficiency. A drip culture method was developed whereby the plants could have access to both aluminum and phosphorus, while at the same time aluminum precipitation in the culture solution could be avoided. Analyses of the plants from each culture series in these tests indicated that (1) damage to the plant as a whole probably resulted from the poor root system induced by the presence of aluminum; (2) aluminum was precipitated immediately in that half of the root system in direct contact with aluminum, whereas the other half of the root system not in contact with aluminum, and the tops, grew practically as well as the control plants; and (3) in the series where each half of the root system was in a culture solution containing both aluminum and phosphorus, internal precipitation evidently played an important role in retarding growth, since, if the precipitation were external, the fairly large amounts of aluminum and phosphorus inside the roots of these plants could not be satisfactorily explained.

It is believed that most workers have overemphasized the external mutual precipitation of aluminum and phosphorus and have overlooked the fact that the internal precipitation of phosphorus by aluminum evidently plays an important role in the poor development of certain plants grown in acid soil. The corrective effect of large applications of superphosphate to such soils is attributed largely to the internal precipitation of aluminum by phosphorus, with sufficient phosphorus remaining for the metabolic processes of the plant.

Effect of boron deficiency upon the structure of Zea mays, E. T. Eltinge (*Plant Physiol.*, *11* (*1936*), *No. 4*, *pp. 765–778*, *figs. 9*).—In the cultures studied, the first visible effects of boron deficiency appeared on the seventh day as a chlorosis between the veins of the older leaves and failure of the youngest

leaves to unroll normally (due apparently to a colorless jelly). Later formed leaves in some cases broke through and developed partially. From the seventh day the roots exhibited enlarged, cheesy tips, and secondary root primordia developed very close to the root cap. The dry weight of affected plants was higher. A disintegration of parenchyma cells appeared at 4–5 days, accompanied by a filling of some of the air spaces with material staining like the jelly on the leaves. Later there were parts where the entire cross section of the leaf collapsed into a thin band staining red with safranin. In other places the cells had failed to differentiate, and in still others the cells were hypertrophied. Some leaves were thickened, in some cases apparently due to cell enlargement and in others to additional cell layers. At the end of 2 weeks, disintegrating cells occurred in the tip of the stem, and by the end of 3 weeks these areas had enlarged and become especially noticeable where secondary shoot primordia were developing.

The time required for the appearance of the deficiency symptoms seemed to depend on the length of time the plants had been in the boron-deficient solution rather than on their age or previous treatment.

GENETICS

Cytogenetic studies in Triticum monococcum L. and T. aegilopoides Bal., L. Smith (*Missouri Sta. Res. Bul. 248 (1936), pp. 38, figs. 32*).—Most plant characters of the varieties of wild einkorn, *T. aegilopoides*, have been dominant over those of varieties of the cultivated form, *T. monococcum*. Genic differentiation in these species has been accompanied by few or minor rearrangements in structure of the chromosomes.

The five inter- and intraspecific hybrids, studied in cooperation with the U. S. Department of Agriculture and involving *T. aegilopoides baidaricum*, had a ring of four chromosomes plus five pairs at diakinesis and first metaphase. *T. monococcum flavescens* × *T. aegilopoides stramineonigrum*, had seven pairs and no ring at meiosis. Hence, the ring-forming complex seems not to be a specific characteristic. Intraspecific hybrids in *T. monococcum* involving three varieties had seven pairs and no ring at meiosis. The ring was transmitted to about one-half of the F_2 and three-fifths of the backcross progeny. Ring-forming F_2 plants heterozygous for a factor for green base seedlings segregated a high proportion of the recessive. In F_2 and F_3 the factor affecting the green base ratio was occasionally present in normal plants and absent in ring-forming plants, indicating that the green base factor and a factor modifying its transmission are linked and associated with one of the ring-forming chromosomes. Most F_2 ring-forming plants produced pollen indistinguishable from that of normal sibs. Seed production of F_2 ring-forming plants was 75 percent of that of normal sibs (65 percent perfect). Fourteen of 17 cases of induced chromosomal rings found proved to have complete ovule fertility. The pollen of 6 examined was normal in appearance.

Of the three types of dissociation of homologous chromosomes at meiosis observed in individuals of the F_2 and F_3 of interspecific crosses involving *T. aegilopoides baidaricum*, one type apparently was determined by supplementary recessive genes, one coming from varieties of *T. monococcum* and one from *T. aegilopoides baidaricum*. Two other types found only in occasional plants appeared to be related genetically to the first type. Two of several cases of induced sterility found were examined cytologically and found to result from disturbances of the meiotic process.

Thirty haploids in *T. monococcum* were observed incidentally in these studies, 9 occurring in the progeny of one plant. Forty-eight genetic characters, includ-

ing 42 induced mutants, are described. Two induced early maturing types make possible the growing of at least 3 crops per year. F_2 and backcross data from 21 crosses involving induced and naturally occurring mutants are presented.

Satellites were found on two of the seven pairs of chromosomes in *T. monococcum*. Their presence, together with the known differences in total length, relative arm length, and position of secondary constrictions, is held to make possible the identification of individual chromosomes.

Crossing over in tomatoes trisomic for the "A" or first chromosome, J. W. LESLEY (*Genetics, 22 (1937), No. 2, pp. 297–306*).—This is a further contribution (E. S. R., 74, p. 180) to genetic studies with the tomato conducted by the California Experiment Station, Riverside.

Inheritance of certain fruit and seed characters in watermelons, D. R. PORTER (*Hilgardia [California Sta.], 10 (1937), No. 12, pp. 489–509, figs. 8*).—Using as parents varieties which had been inbred for several generations to insure homozygosity, it was found that in the crosses studied red flesh is dominant over yellow, black seed color over white and also over tan, and that yellowish-white skin color in the Snowball variety is recessive to dark green in Angeleno and California Klondike, dominance in all cases being apparently on a single-factor basis. In crossing California Klondike dark green with Thurmond Gray yellowish green, the F_1 color indicated incomplete dominance favoring the darker parent. The segregation of color taking place in backcrosses of the seedlings with both parents suggested that single-factor differences governed segregation. Skin stripedness of Golden Honey was incompletely dominant to dark-green skin of California Klondike. Rind toughness of Golden Honey and Thurmond Gray was dominant to tenderness in California Klondike, the segregation in the F_2 indicating a single-factor difference.

No evidence of linkage was observed between (1) color of flesh and seed coat, (2) flesh and fruit-skin colors, (3) flesh color and rind toughness, (4) fruit-skin color and rind toughness, (5) seed-coat color and rind toughness, and (6) skin color with seed-coat color.

Virus mutation and the gene concept, H. H. MCKINNEY (*Jour. Heredity, 28 (1937), No. 2, pp. 51–57, figs. 3*).—From a critical review of previous work, including his own and with particular reference to the mosaic group, the author believes that the available evidence tends to favor the view that the virus and its mutants embrace the essential elements of lineage or inheritance. This view is based on the evidence that the virus and its mutants and submutants regenerate true to measurable types, and that the mutants and submutants tend to retain certain characteristics of the primary virus and the submutants to retain certain characteristics of the strains from which they were derived. It would appear that these combined features, rather than Mendelian segregation, must serve as the basic test for inheritance, otherwise the stand would be taken that inheritance does not exist in asexual organisms. In any case, the primary virus and its mutants are believed to reflect a series of closely related compounds which function essentially as genes. The several characteristics of a given virus may reflect properties of a single compound, and changes in any of these characteristics—mutations—may reflect alterations in this compound.

Heredity of cryptorchidism in sheep, [I], II, ÎA. L. GLEMBOTSKIĬ (J. Z. GLEMBOTSKY) and S. B. MOISEEV (*Vsesoiûzn. Inst. Zhivotn. [Moskva], Uspekhi Zootekh. Nauk (All-Union Sci. Inst. Anim. Husb., Adv. Zootech. Sci.), 1 (1935), No. 1, pp. 5–28, figs. 5; Eng. abs., pp. 27, 28; 3 (1936), No. 1, pp. 5–50, figs. 21; Eng. abs., p. 50*).—The occurrence of from 10 to 15 percent cryptorchid rams, most of which were bilateral, in the Wallachian and Precoces breeds was attributed to the operation of a single pair of recessive genes. The cryptorchid

condition was associated with hornlessness, as all the polled Precoces rams were heterozygotes or cryptorchids. It is suggested that eventually the use of polled rams may result in 25 percent of the males born being cryptorchids.

In the second article, further experimental data confirmed the relation between hornlessness and cryptorchidism in Precoces sheep. All of 312 dicryptorchids were polled. Variations in the number of crytorchid progeny were related to the polled or horned condition of the rams and ewes. Some irregularities observed, such as horned cryptorchids, needed further investigation. A semilethal condition designated as bend of the neck was, in most cases, associated with cryptorchidism. Dicryptorchids weighed 6 to 8 percent less at one year of age than normal rams, but wool production did not differ.

Studies of multiple allelomorphic series in the house-mouse, I, II (*Jour. Genet., 33 (1936), No. 3, pp. 443–453; 34 (1937), No. 1, pp. 1–18, figs. 2*).—Two parts of this series are noted.

I. *Description of agouti and albino series of allelomorphs*, L. C. Dunn.—Study is reported of the effects of the genes in the albino series C, c^{ch}, c^{h}, and c^{a} on black and yellow pigmentation in the agouti series A^{Y}, A^{L}, A, a^{t}, and a in the mouse. The allels to C dilute both black and yellow but yellow is more affected than black, being entirely suppressed by c^{h} and c^{a}. Black is little affected by c^{ch}, considerably diluted by c^{h}, and suppressed only by c^{a}. Brown was even less affected by these genes than black. In combination with the pink-eye factor, c^{h} and p act in a cumulative manner and cause greater dilution of black than either one alone. One individual combining c^{ch} with the blue dilution factor d was light blue in the black parts and lighter than individuals with either c^{ch} or d alone.

II. *Methods for the quantitative estimation of melanin*, W. Einsele.—*A method is presented for isolating and studying the melanin pigment in the hairs of mice of different genotypes as to the percentage of melanin present, the intensity of the color, and the size of the granules.*

Abortive differentiation of the ear vesicles following a hereditary brain-anomaly in the "short-tailed waltzing mice", K. Bonnevie (*Genetica ['s Gravenhage], 18 (1936), No. 5–6, pp. 105–125, pls. 3, figs. 12*).—A comparative study of the ear vesicles of normal and "shaker-short" embryos[1] of a strain of short-tailed waltzing mice shows on the ninth day of embryonic development an abortive differentiation of the shape of the ear vesicles dependent on the brain anomalies of the "shaker-short" strain. Morphological variations from normal in the ear vesicles of these mice are described.

Hairless rats found to have a shortened life cycle (*Illinois Sta. Rpt. 1935, pp. 114, 115*).—Hairlessness in the rat was found by E. Roberts and J. H. Quisenberry to be inherited independently of the genes for albinism, nonagouti, spotting, dilution, and red eye. The duration of life of hairless rats was shortened as contrasted with normals.

Genogeography of the domestic fowl, A. S. Serebrovskiĭ (Serebrovsky) (*Vsesoiūzn. Inst. Zhivotn. [Moskva], Uspekhi Zootekh. Nauk (All-Union Sci. Inst. Anim. Husb., Adv. Zootech. Sci.), 1 (1935), No. 1, pp. 85–142, figs. 17; Eng. abs., pp. 141, 142*).—An account of the genes carried by the fowls native to different regions of the Balkans.

Relative growth and hereditary size limitation in the domestic fowl, I. M. Lerner (*Hilgardia [California Sta.], 10 (1937), No. 13, pp. 511–560, figs. 3*).—Studies of the heterogonic growth relations in Plymouth Rock and Minorca fowls indicated that the growth of the pectoralis major in relation to body weight and the leg bones follows a similar course in the two breeds, and that

[1] Acta Path. et Microbiol. Scand., Sup. 26 (1936), pp. 20–26, figs. 2.

their hybrids possess the same pattern of growth. Studies of other breeds of fowls also confirmed this. It thus appears that a basic genetic complex for size interrelation of parts exists in the fowl, which does not necessarily have a bearing on the ultimate size. Different relations were evident in Bantams, where hypogony was present in the leg bones, as indicated by the value of the constant k being less than unity in the equation $y=bx^k$. It is suggested that Bantams possess growth-retarding factors affecting not only total body size but also the relative rate of growth of the parts.

Further data on genetic modification of rumplessness in the fowl, L. C. DUNN and W. LANDAUER (*Jour. Genet.*, *33* (*1936*), *No. 3*, *pp. 401–405*).—Further studies of the genetics of rumplessness in the fowl at the [Connecticut] Storrs Experiment Station have demonstrated the presence of multiple and recessive modifiers toward the normal of the rumpless condition in both heterozygotes and homozygotes. These may in some cases extinguish all external character differences between heterozygotes and normals, a condition discovered only on dissection.

The physiology of cold blackening in Russian rabbits.—II, The influence of Röntgen rays on pigment formation [trans. title], R. DANNEEL and E. LUBNOW (*Biol. Zentbl.*, *56* (*1936*), *No. 11–12*, *pp. 572–584*, *figs. 3*).—Continuing this series (E. S. R., 76, p. 24), treatment with Röntgen rays of portions of the skin of black Alaska rabbits from which the hair had been plucked caused the newly developing hair to come in lighter in color, and with heavier radiation it was white. Röntgen rays had the same effect on newly developing hair in the Russian rabbit as was produced by cold. It is suggested that the irradiation rendered the mitochondria of the hair-building cells nonfunctional and prevented normal pigment formation.

On the mating periods of the mare, V. A. SHCHEKIN (*Prob. Zhivotn.* (*Prob. Anim. Husb.*), *No. 8* (*1936*), *pp. 14–27*; *Eng. abs.*, *p. 27*).—General directions for handling the breeding mare during the mating season are presented, with special reference to mares with long heat periods. Best results are obtained in normal heat periods with matings 3 to 4 days before the end of heat.

Oestrus and ovulation in the mare, L. M. MIRSKAIA (MIRSKAYA) and A. A. ZALTSMAN (SALZMAN) (*Vsesoiuzn. Inst. Zhivotn.* [*Moskva*], *Uspekhi Zootekh. Nauk* (*All-Union Sci. Inst. Anim. Husb.*, *Adv. Zootech. Sci.*), *1* (*1935*), *No. 1*, *pp. 157–168*, *figs. 2*; *Eng. abs.*, *p. 168*).—A study of the vaginal smear of 45 mares showed that during oestrus the smear consisted only of cornified epithelial cells, and the mucous membrane is hyperemic and moist with the cervix relaxed. Based on data from 53 mares, the duration of oestrus ranged from 2 to 11 days, averaging 5.65 days. The range depends upon the rate of growth of the follicle but ovulation occurred from one to two or rarely three days before mating desire ceased. The size of the follicles at the same stage of maturity was variable, but the threshold for expressing mating desire based on reaction to the stallion was related to the size of the follicle on the first day of the heat period.

Vaginal method of pregnancy diagnosis in the mare, K. BARULIN (C. BAROULIN), E. BURCHENKO (BOURCHENKO), and A. POPOV (*Prob. Zhivotn.* (*Prob. Anim. Husb.*), *No. 8* (*1936*), *pp. 42–53*; *Eng. abs.*, *p. 53*).—Results are presented with pregnancy tests based on the appearance of thick, turbid, and clammy mucous in the vagina of pregnant mares. About 50 percent of the mares showed positive test during the second 10-day period after mating, whereas the majority of the pregnant mares gave positive tests between 40 and 60 days after conception. Pregnant animals showed the presence of mucous balls not evident in nonpregnant mares.

Sex physiology of sheep, L. L. Roux (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 6 (1936), No. 2, pp. 465–717, figs. 48*).—This report comprehensively reviews the literature and presents results of extensive experimentation on the influence of nutrition upon the sexual activity of Merino ewes; the morphology of the ovaries of Merino sheep during anoestrus; the duration of the phases of the dioestrous cycle in Merino sheep; the period of the absence of oestrus after parturition in Merino sheep; the sexual season of cross-bred sheep; the age of puberty of Merino and cross-bred sheep; the influence of climate upon the sexual activity of young Merino ewes; the effects of inoculation, shearing, and dipping upon sexual activity; and the artificial induction of oestrus during anoestrus. The report is concluded with a discussion of certain principles of sex physiology in relation to practical sheep husbandry.

Studies on the physiology of reproduction in the sheep.—IV, Fetal development, L. M. Winters and G. Feuffel (*Minnesota Sta. Tech. Bul. 118 (1936), pp. 20, figs. 12*).—Continuing this series of studies (E. S. R., 75, p. 469), data are reported on the weights and measurements of 73 fetuses from 46 ewes killed at different stages of the gestation period, ranging from 34 to 140 days. The ewes prior to the test were divided into three groups, one being larger than the rest, and of the other two groups, one was placed on a higher and the other a lower plane of nutrition. The results showed no difference in the rate of fetal development in the fetuses of the ewes in the different groups. Single lambs were slightly larger than twins after the seventieth day of the gestation period. Four corpora lutea were observed which on macroscopic examination appeared single but on microscopic examination were found to contain two fused corpora lutea.

Artificial insemination of she-goats, V. V. Polovtseva and M. V. Fomenko (*Vsesoiuzn. Inst. Zhivotn.* [*Moskva*], *Uspekhi Zootekh. Nauk* (*All-Union Sci. Inst. Anim. Husb., Adv. Zootech. Sci.*), *3 (1936), No. 1, pp. 51–65, figs. 6; Eng. abs., p. 65*).—Artificial insemination was successfully carried out with 650 does. Doses of 0.025 to 0.05 cc of semen were as successful as doses of 0.1 to 0.2 cc, producing about 90 percent fertility. The sexual cycle of the goat ranged from 12 to 24 days, averaging 19.42±0.49 day, with the duration of oestrus ranging from 1 to 4 days and averaging 39.16±1.9 hr. Fertility decreased toward the end of the breeding season. The duration of all gestations averaged 148.8±0.09 days, with twins being about one day shorter than singles. Aged does were more fertile than those bred at 1 and 2 yr. of age. Angora goats showed a stronger sexual activity than milk goats. Of the kids produced 47.8 percent were males and 52.2 percent were females.

The production and changes in the endometrium of swine in relation to the function of the uterus [trans. title], B. P. Khvatov (Chwatow) and N. N. Kuznetsov (Kusnezow) (*Vsesoiuzn. Inst. Zhivotn.* [*Moskva*], *Uspekhi Zootekh. Nauk* (*All-Union Sci. Inst. Anim. Husb., Adv. Zootech. Sci.*), *1 (1935), No. 1, pp. 169–175, figs. 2; Ger. abs., p. 175*).—Histological study was made of the mucous membrane of the uteri of parous and nonparous sows. After 5 to 6 days, prolan injections in young gilts were found to produce changes in the uterus and broad ligament similar to those occurring during pregnancy.

The germ cell cycle in the guinea pig, I, II, C. G. Bookhout (*Ztschr. Zellforsch. u. Mikros. Anat., 25 (1937), No. 5, pp. 728–748, figs. 15; pp. 749–763, figs. 14*).—Two papers are presented in this series. In the first, The Embryonic Development of the Testis, a description is given of the primordial germ cells in timed guinea pig fetuses and the subsequent changes evident during growth of the testicle up until the time of parturition. In the second, The Postnatal Development of the Testis, a description is continued of the postnatal development until the time of sexual maturity.

Studies on the physiology of lactation.—III, The reciprocal hypophyseal-ovarian relationship as a factor in the control of lactation, W. O. NELSON (*Endocrinology, 18 (1934), No. 1, pp. 33–46, figs. 2*).—Continuing the series previously noted (E. S. R., 75, p. 614), study of the influence of the administration of the lactogenic hormone and removal of gonads or uteri during pregnancy in guinea pigs led to the conclusion that the ovarian hormones are active in promoting mammary gland growth during gestation and that they also inhibit the secretion of the lactation-inducing hormone of the pituitary until after parturition.

Studies on the physiology of lactation, IV, V (*Anat. Rec., 60 (1934), No. 1, pp. 69–76; 66 (1936), No. 2, pp. 201–215, figs. 14*).—Two papers in this series (above noted) are presented.

IV. *The assay of the lactogenic hormone of the anterior hypophysis*, W. O. Nelson.—The merits of various methods of assaying the lactogenic hormone of the hypophysis are discussed. The female guinea pig, hysterectomized at 40 to 50 days of gestation, and the pseudopregnant rabbit provide test animals in which the mammary glands are prepared for normal lactation. Except for not depending on a milk secretion response, the crop gland test in the pigeon is quantitative and has certain advantages.

V. *The induction of lactation in depancreatized dogs*, W. O. Nelson, H. E. Himwich, and J. P. Fazekas.—Lactation was initiated in five of nine bitches by the administration of lactogenic hormone. An adequate proliferation of the mammary gland prior to treatment with the lactogenic hormone was essential if lactation was to be induced.

On the physiology of lactation, M. SKARZHINKSAÎA (SCARZHINSKAYA) (*Vsesoîuzn. Inst. Zhivotn. [Moskva], Uspekhi Zootekh. Nauk (All-Union Sci. Inst. Anim. Husb., Adv. Zootech. Sci.), 3 (1936), No. 1, pp. 67–78; Eng. abs., p. 78*).—Injections of pituitary extracts into cows during the second to fourth months of lactation and in the first half of gestation caused an increase in milk production without subsequent injurious effects on the cow or on subsequent production. Prolactin did not increase production.

On the physiology of lactation, G. I. AZIMOV and N. K. KRUZE (*Vsesoîuzn. Inst. Zhivotn. [Moskva], Uspekhi Zootekh. Nauk (All-Union Sci. Inst. Anim. Husb., Adv. Zootech. Sci.), 3 (1936), No. 1, pp. 79–111; Eng. abs. pp. 110, 111*).—Lactogenic extracts of the anterior pituitary caused a 15 percent increase in the milk production without later depression in production in cows.

Effect of thyroxine and galactin on lactation in hypophysectomized guinea pigs, E. T. GOMEZ and C. W. TURNER (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 1, pp. 80, 81*).—Continuing these studies at the Missouri Experiment Station (E. S. R., 76, p. 465), the authors were unable to prevent the rapid cessation of milk production which follows hypophysectomy in lactating animals by the administration of thyroxine in addition to galactin. Attention, however, was called to the increases and decreases in milk production which follow thyroxine administration or thyroidectomy, respectively, in normal animals.

Lactogenic preparation from anterior pituitary, G. I. AZIMOV, M. N. LAPINER, M. I. SKARZHINSKAÎA (SKCARGINSKAÎA), N. P. PARIÎSKAÎA, and A. V. KORSAKOVA (*Vsesoîuzn. Inst. Zhivotn. [Moskva], Uspekhi Zootekh. Nauk (All-Union Sci. Inst. Anim. Husb., Adv. Zootech. Sci.), 1 (1935), No. 1, pp. 143–156; Eng. abs., p. 156*).—Acid and alkaline extracts of the anterior pituitary were tested on rabbits, dogs, guinea pigs, dairy cows, sows, and pigeons as to their lactogenic effects. Differences in the response were noted.

Practical application of lactogenic hypophysis preparations, G. I. Azimov, N. Kruze (Krouze), M. Skarzhinskaiâ (Skarshinskaya), A. Makhova, and O. Fominskaiâ (Fominskaya) (*Prob. Zhivotn.* (*Prob. Anim. Husb.*), *No. 8* (*1936*), *pp. 28–41, figs. 5; Eng. abs., p. 41*).—Increases in the milk yield were produced by injections of lactogenic hormones consisting of extracts of the entire anterior pituitary. The injections were harmless and had no undesirable aftereffects. The best results were obtained during the first half of the lactation period.

Effect of lactogenic hormone injections on the crop gland of the hypophysectomized pigeon, E. T. Gomez and C. W. Turner (*Soc. Expt. Biol. and Med. Proc., 35* (*1936*), *No. 1, p. 59*).—In studies at the Missouri Experiment Station, prolactin was incapable of causing crop gland proliferation in hypophysectomized pigeons.

Inability of sheep to develop antihormone to the gonadotropic hormone from sheep-pituitary glands, K. W. Thompson (*Soc. Expt. Biol. and Med. Proc., 35* (*1937*), *No. 4, pp. 634–637*).—Data are reported on the injection of extracts of fresh and dried sheep pituitary into two ewes for six months' periods. The results revealed no evidence of the production of antibodies to the gonadotropic hormones. In experiments with other species, the same sheep pituitary extracts produced antigonadotropic hormones. These results lend support to the conception that antihormones are the product of the reaction of the animal to an antigen.

Inhibition of action of pituitary hormones by animal sera, K. W. Thompson and H. Cushing (*Roy. Soc.* [*London*] *Proc., Ser. B., 121* (*1937*), *No. 824, pp. 501–517, pl. 1, figs. 4*).—The daily administration for 17 mo. of an extract of sheep pituitary to a female collie caused the blood serum of this dog, when injected into rats prior to the 100-hr. test period, to counteract completely the action of the gonadotropic hormones from sheep and hog pituitaries, human menopause and pregnancy urine, and from the serum of pregnant mares. The action of gonadotropic hormones from sheep and hog pituitaries, human pregnancy urine, and pregnant mare serum was partially checked by dog serum rendered antagonistic by 4-mo. daily injections with gonadotropic extract of pregnant mare serum.

The augmentary factor in animal sera after injections of pituitary extract, K. W. Thompson (*Soc. Expt. Biol. and Med. Proc., 35* (*1937*), *No. 4, pp. 640–644, fig. 1*).—The blood serum from a mare and two dogs to which were administered extract of sheep pituitary glands was found to augment the effect of the extract on the ovarian weight in rats. This effect is attributed to the presence of an antihormone to the antagonist in the blood serum of the injected dogs and mare. The augmenting factor was present only in the pseudoglobulin fraction of the serum.

Effect of stimulus of suckling upon galactin content of the rat pituitary, R. P. Reece and C. W. Turner (*Soc. Expt. Biol. and Med. Proc., 35* (*1937*), *No. 4, pp. 621, 622*).—In further studies at the Missouri Experiment Station (see above), the bird units of galactin in the pituitary of post partum rats not suckled for 15 hr. was 9.2 as compared with 5.2 for rats suckled but from which no milk was removed because the primary milk duct was ligated. The amount of galactin per pituitary was still further reduced to 3.06 bird units in animals which were suckled and the milk removed.

Galactin content of the rat pituitary, R. P. Reece and C. W. Turner (*Soc. Expt. Biol. and Med. Proc., 35* (*1936*), *No. 1, pp. 60–62*).—Data are reported from the Missouri Experiment Station on the galactin content of the pituitary glands of normal and castrated male rats and pregnant and post partum females. The results show that the bird units of galactin incr as the

ınimal matures, largely due to the increased weight of the gland. Where ıormones increased or decreased pituitary weight, the galactin content was likewise generally increased or decreased, respectively. Female rats showed the presence of more galactin in their pituitary glands than male rats. At 48 hours post partum the galactin content of the pituitary doubled as compared with the normal, but at 10 days post partum the galactin content of the gland decreased and was midway between the glands of normal females and 48-hr. post partum females.

Hormone production in the undescended testis, F. M. Hanes and C. W. Hooker (*Soc. Expt. Biol. and Med. Proc., 35 (1937), No. 4, pp. 549, 550*).—Assays of the male hormone in normal and cryptorchid swine testicles showed that there was about twice as much hormone per unit of weight in the normal as in the cryptorchid organs, notwithstanding the hypertrophy of the interstitial cells in such cases.

Physico-chemical indexes of the sperm of domestic animals, A. Bernshteĭn (Bernstein) and N. Shergin (*Vsesoĭūzn. Inst. Zhivotn.* [*Moskva*], *Uspekhi Zootekh. Nauk* (*All-Union Sci. Inst. Anim. Husb., Adv. Zootech. Sci.*), *2 (1936), No. 1, pp. 5–18, fig. 1; Eng. abs., pp. 17, 18*).—Physicochemical studies dealing especially with the electrical conductivity are reported on the semen of the ram, bull, stallion, buck, boar, man, and drake.

The potassium, sodium, and calcium content in the sperm and secretions of the sexual glands of the boar, T. N. Nesmeĭanova (*Vsesoĭūzn. Inst. Zhivotn.* [*Moskva*], *Uspekhi Zootekh. Nauk* (*All-Union Sci. Inst. Anim. Husb., Adv. Zootech. Sci.*), *2 (1936), No. 2, pp. 252–266, figs. 4; Eng. abs., pp. 265, 266*).—Analysis of the potassium, sodium, and calcium content of the semen, blood serum, and secretions of the epididymis and seminal vesicles of the boar showed that the spermatozoa prior to leaving the epididymis are in surroundings poor in electrolytes, but during ejaculation the surroundings are rich in electrolytes, particularly sodium.

Duration of the vitality of spermatozoa of a bull in epidydymis isolated from the testiculae, V. S. Kirillov and V. A. Morozov (Morosov) (*Vsesoĭūzn. Inst. Zhivotn.* [*Moskva*], *Uspekhi Zootekh. Nauk* (*All-Union Sci. Inst. Anim. Husb., Adv. Zootech. Sci.*), *2 (1936), No. 1, pp. 19–22, fig. 1; Eng. abs., p. 22*).—Following ligature of the epididymis of the bull, 70 percent of the spermatozoa were found to retain progressive movement after 37 days and an oscillating movement for more than 2 mo. Sperm were discharged at copulation approximately 3 to 4 mo. after the operation.

The relation of antecedent egg production to the sex ratio in the domestic fowl, M. O. K͡horosh (Horosh) (*Vsesoĭūzn. Inst. Zhivotn.* [*Moskva*], *Uspekhi Zootekh. Nauk* (*All-Union Sci. Inst. Anim. Husb., Adv. Zootech. Sci.*) *2 (1936), No. 1, pp. 95–102, fig. 1; Eng. abs., pp. 101, 102*).—A study of the sex ratios of chicks produced by nearly 300 hens, in contradiction of data presented by Jull (E. S. R., 52, p. 77), indicated no relation between the sex ratio and the antecedent egg production of the dams.

The hen's egg not fertilized in the ovary, C. G. Hartman (*Science, 85 (1937), No. 2200, p. 218*).—From an analysis of the results of other investigators, including especially those of Warren and Kilpatrick (E. S. R., 63, p. 727), the author concludes that the hen's egg is not fertilized in the ovary.

Hatchability as related to seasons and hour of laying, F. A. Hays (*Poultry Sci., 16 (1937), No. 2, pp. 85–89, figs. 8*).—Data are presented on the hatching of eggs laid at different times of the day and at different seasons by hens and pullets over a 20-yr. period at the Massachusetts Experiment Station. The results showed that hatchability increased as the hatching season advanced for

the hens but not for the pullets. Forenoon and afternoon eggs did not differ in fertility, mortality, or hatchability of the fertile eggs.

Light in relation to the experimental modification of the breeding season of turkeys, H. M. Scott and L. F. Payne (*Poultry Sci., 16 (1937), No. 2, pp. 90–96, figs. 2*).—Through the use of morning lights from 4:30 a. m. to daylight from December 1 to February 1 at the Kansas Experiment Station, housed turkey hens were induced to begin laying on January 3 at 242 days of age. Similar turkeys not subjected to light with and without housing started laying on March 9 and 10 at 307 and 308 days of age.

In further experiments white and red lights were found to stimulate earlier sexual maturity, although blue light failed to exert any influence. As food consumption varied only slightly during the first part of the experiment, light is considered to be the controlling factor in inducing early maturity. Housing was also found to have no influence on ovarian activity. Where the lighting period coincided with daylight no stimulation was effected. Attempts to hasten sexual maturity in the guinea fowl by light were ineffective.

FIELD CROPS

[Research with field crops in Illinois], W. L. Burlison, C. A. Van Doren, J. C. Hackleman, C. M. Woodworth, O. H. Sears, L. E. Allison, J. J. Pieper, W. P. Flint, J. H. Bigger, B. Koehler, W. J. Mumm, J. R. Holbert, G. H. Dungan, A. L. Lang, D. C. Wimer, E. E. De Turk, E. B. Earley, E. W. Lehmann, R. H. Reed, O. T. Bonnett, and H. H. McKinney (*Illinois Sta. Rpt. 1935, pp. 39–72, figs. 8*).—The reports of progress of investigations in field crops included in these pages (E. S. R., 74, p. 477) deal with variety trials with corn (and corn hybrids), winter and spring wheat, oats, barley, buckwheat, grain sorghum, alfalfa, red clover (strains), soybeans, seed flax, and safflower; "fermentation time" tests with winter wheat strains; breeding work with corn for oil and protein content, length of ear, number of ears, and resistance to *Aspergillus flavus*, and with wheat, oats, and soybeans; improvement of corn by topcrossing and by reconstitution; reduction of losses from ear rots by resistant corn hybrids; relative susceptibility of smooth v. rough kernels of corn to seed coat injury; the inheritance of seed characters in soybeans; cultural (including planting) tests with red clover and other clovers; nurse crop and cutting tests with red clover; studies of the shrinkage of corn and other crops in storage; analyses of yields of varieties of winter wheat with studies of factors contributing to yields of the wheat plant, such as diameter of stem, soil moisture content, and development of the wheat spike; the occurrence of wheat mosaic in different counties and on different varieties; fertility value of cornstalk ash and residues and of straw, and growing soybeans, all for soil improvement; investigation of the nutrition of the corn plant and the development by selection and breeding of desirable nutritional habits; the relation of straw to the feeding power of plants and to the usefulness of the minerals present in the soil; studies of the factors influencing the nodulation of legumes; comparison of types of inoculants; tests of chlorates and other chemicals for poison-ivy, Canada thistle, and quackgrass; life history and control studies with wild garlic and onions; production studies with crops relatively new to Illinois, including pyrethrum, safflower, Russian hemp, flax, buckwheat, and Jerusalem-artichoke; and utilization of soybean oil in paints. Certain activities proceeded in cooperation with the U. S. Department of Agriculture.

[Field crops experiments in Indiana] (*Indiana Sta. Rpt. 1936, pp. 18–21, 71, 73, fig. 1*).—Investigations with field crops again reviewed briefly (E. S. R.,

75, p. 766) included breeding work and seed improvement with wheat; variety trials with oats and soybeans; planting tests with corn, oats, and soybeans; fertilizer experiments with corn, alfalfa, and pasture; manurial value of crop residues from corn, soybeans, and wheat; the need of soybeans for reinoculation; reestablishment of grass cover on eroded land; substitution of alfalfa for part of the clover in seed mixtures; and tests of *Lespedeza sericea* and winter oats.

[Field crops investigations in Tennessee], H. P. OGDEN, N. I. HANCOCK, L. S. MAYER, B. D. DRAIN, L. R. NEEL, B. P. HAZLEWOOD, and L. A. FISTER (*Tennessee Sta. Rpt. 1936, pp. 8, 9–13, 15–19, 47, 48, 51, 52, 53, 54, 55–57, 59–63, 68, figs. 4*).—Field crops research at the station and substations (E. S. R., 76, p. 29) briefly comprised breeding work with corn, cotton, oats, wheat, barley, rye, sweetpotatoes, soybeans, and winter peas; selection of *Lespedeza sericea* for tannin content; variety trials with corn (and comparisons of corn hybrids), cotton, wheat, oats, rye, barley, potatoes, sweetpotatoes, soybeans, lespedeza, and red clover strains; cultural, including planting, experiments with corn, cotton, oats, soybeans, annual lespedeza, and *L. sericea*; seeding of cowpeas in corn as a last cultivation; cutting tests with *L. sericea*; fertilizer experiments with corn, cotton, barley, sorgo, and annual lespedezas; seed treatments and seeding tests with *L. sericea* and crimson clover; experiments on the possibility of producing sugar beet seed in Tennessee; tests of new phosphorus carriers for wheat, lespedeza, and corn; comparison of winter cover crops; pasture experiments; trials of winter crops for pasture; crop rotations; and weed killing with calcium cyanamide. Certain lines of work were in cooperation with the U. S. Department of Agriculture and the Tennessee Valley Authority.

[Agronomic experiments in Washington], E. G. SCHAFER, O. E. BARBEE, O. A. VOGEL, E. F. GAINES, R. M. WEIHING, A. M. SCHLEHUBER, D. C. SMITH, C. L. VINCENT, L. K. JONES, C. I. SEELY, H. P. SINGLETON, and C. A. LARSON (*Washington Sta. Bul. 342 (1936), pp. 10–14, 44, 57–62, 64, 65*).—Field crops research (E. S. R., 75, p. 38), reported on from the station and substations and in some lines in cooperation with the U. S. Department of Agriculture, comprised variety tests with spring and winter wheat, barley, oats, rye, corn, alfalfa, sweetclover, and red clover (strains); breeding work with potatoes and forage grasses; resistance of wheat to physiologic forms of bunt; inheritance and improvement studies with corn, barley, oats, and wheat; cultural (including planting) studies with forage grasses and strawberry clover; storage tests with washed potatoes; permanent fertility and organic matter maintenance studies; fertilizer tests with alfalfa and with potatoes, corn, and wheat in rotation; crop rotations; behavior of wheat, oats, and barley on summer fallow v. pea land; study of competition between alfalfa and sweetclover and cereals and grasses as companion crops; and weed control experiments.

The effect of tillage method, crop sequence, and date of seeding upon the yield and quality of cereals and other crops grown under dry-land conditions in north-central Montana, M. A. BELL (*Montana Sta. Bul. 336 (1937), pp. 123, figs. 25*).—Information with supporting data derived from investigations with field crops grown under dry land conditions at the Northern Montana Substation, near Havre, 1916–35, made in cooperation with the U. S. D. A. Bureau of Plant Industry, is summarized, with brief discussions suggesting possibilities of practical application to dry land farming in north-central Montana. The several experiments and studies were concerned with variation in crop yields because of seasonal conditions; the influence of tillage on yields of spring and winter wheat, barley, oats, corn, flax, rye, potatoes,

and sugar beets; other facts about tillage methods, including features of the fallow system, yields on disking after intertilled crops, spring v. fall plowing, and results with fall listing, disked stubble, and other tillage methods, and from spring listing for corn; results from depth of plowing experiments with small grains, for fallow, and stubble land in the spring and fall; results from different methods of preparing fallow as to time of plowing, plowed v. plowless fallow, stubble cultivation before plowing for fallow, and depth of plowing; modification of the alternate fallow and cropping system, including the two crop system, substitution of an intertilled crop for fallow, allowing land to lie idle during fallow period, small grains harvested for hay as a substitute for fallow, and crop rotations for dry land; the influence of corn, flax, barley, oats, and spring wheat as previous crops upon yield, and the effect of continuous cropping; influence of green manures and barnyard manure on succeeding crops; quality of small grains, i. e., test weight and protein, as influenced by tillage method and by other factors, and of size of root crops and sugar content of sugar beets as influenced by tillage; results of date of seeding experiments with spring and winter wheat, oats, barley; spring rye, corn, and flax; crop varieties grown commercially under dry land conditions; the weed problem under dry farming conditions, especially with Russian-thistles, pigweed, mustards, wild oats, and skeletonweed; and the removal of soil moisture by spring wheat and its accumulation in fallowed land, especially in different kinds of fallow.

A digest of pasture research literature in the continental United States and Canada, 1885 to 1935, corrections and additions, February 1937, A. J. PIETERS ([*U. S. Dept. Agr., Bur. Plant Indus.*], *1937, pp. 12*).—Several corrections and 58 additional titles supplement those listed earlier (E. S. R., 75, p. 195).

The influence of rainfall upon tuft area and height growth of three semi-desert range grasses in southern Arizona, P. B. LISTER and F. X. SCHUMACHER (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 2, pp. 109–121, figs. 4*).—Effects of variation in precipitation distribution during a 15-mo. period on the annual density change and height growth of the three forage grasses—three-awn grass (*Aristida* spp.), black grama (*Bouteloua eriopoda*), and Rothrock grama (*B. rothrockii*)—within the growing season of the current year (in the period 1923–32) were determined by statistical analysis. Graphic expressions of the average effect of an added inch of precipitation per month indicated, in the case of the two grama grasses, that the most beneficial precipitation distribution from normal for both density change and height growth consists of relatively dry winters coming between relatively wet autumns and springs. Three-awn grass seemed to be admirably adapted to variation in precipitation distribution characteristic of the area studied in that either positive or negative departure from normal seasonal precipitation benefits, in general, either density change or height growth, although not both at once.

A mixture of alfalfa and smooth brome grass for pasture, H. C. RATHER, C. M. HARRISON, G. A. BROWN, and G. E. TAYLOR (*Michigan Sta. Circ. 159* (*1937*), *pp. 7, fig. 1*).—The mixture of alfalfa and bromegrass, according to results of experiments in progress, furnishes productive and drought-resistant pasturage high in palatability and nutrients and valuable not only in summer but throughout the entire grazing season, and is also adapted to a wide range of conditions in Michigan. Cultural and grazing management practices are outlined briefly.

The 1936 Iowa corn yield test, M. M. RHOADES and J. L. ROBINSON (*Iowa Sta. Bul. 355* (*1937*), *pp. 185–240, fig. 1*).—The 879 entries in the 10 harvested districts of the 1936 Iowa Corn Yield Test, conducted cooperatively as in previ-

ous years (E. S. R., 75, p. 41), were again grouped as regular and experimental open-pollinated and regular and experimental hybrids.

The 1936 yield test was featured by the superior performance of hybrid combinations as compared with open-pollinated varieties, the average yield of all hybrid entries in the 10 fields being 30.8 percent greater than for open-pollinated strains. The hybrid entries also had much more lodging resistance. The average percentage increase of the hybrid class in the 4 easternmost fields was as great as in other districts, whereas in past tests hybrid entries tended to perform relatively better in the western and central districts.

Yields and stands obtained by planting seed of different germinating percentages at rates to give the same theoretical stand were about equal. Seed treatment of the regular entries in the open-pollinated and regular hybrid classes did not affect appreciably either stands or yield in 3 sections, but in the southern section a decrease in yield and stand resulted.

The highest-yielding section entries in the regular open-pollinated, regular hybrid, and experimental hybrid classes, respectively, were for the northern section Golden Krug, National Hybrid 110, and Iowa Hybrid 3215; the north-central section Golden Krug, North Central Iowealth BA, and Iowa Hybrid 3088; the south-central section Morcorn, Iowealth 25B, and Iowa Hybrid 3342; and in the southern section Reid Yellow Dent, Iowa Hybrid 13, and Iowa Hybrid 3395. In the southern section Iowa Hybrid 13 made the greatest relative increase in yield over the average open-pollinated varieties in the history of these corn yield tests, producing 26.9 percent more corn than its class average and 79 percent more than the open-pollinated class average.

In 4 of the 10 fields the lowest-yielding strain of all classes of entries was a regular hybrid, demonstrating that not all hybrids are good, and that the purchaser of hybrid seed should buy only known hybrids of proved worth.

Important factors in cotton growing in North Carolina, P. H. Kime (*North Carolina Sta. Agron. Inform. Circ. 106 (1937), pp. [1]+5*).—The factors discussed include soils and their preparation, varieties, planting and spacing, cultivation, picking, storage, ginning, and handling of planting seed.

Results of cotton variety experiments, 1931–1936, P. H. Kime (*North Carolina Sta. Agron. Inform. Circ. 105 (1937), pp. [2]+5*).—Varietal recommendations based on results of further tests with cotton (E. S. R., 73, p. 38) included certain strains of Mexican, Coker, Farm Relief, and Cleveland for the Piedmont; of Farm Relief, Cleveland, Coker, and Mexican for the upper Coastal Plain; of Coker, Foster, and Farm Relief for heavy and poorly drained soils in the lower Coastal Plain; and of Dixie-Triumph, Clevewilt, and Dixie for wilt-infested soils. Surveys in cooperation with the U. S. Department of Agriculture showed the percentage of $^{15}/_{16}$ in. and longer cotton grown in North Carolina in 1936 to be 87.4 as compared with 20.3 in 1928.

Investigations on the mechanical application of fertilizers for cotton in North Carolina, with some results for other crops obtained in other States, E. R. Collins (*North Carolina Sta. Agron. Inform. Circ. 104 (1937), pp. [1]+17, figs. 4*).—Results obtained in cooperative experiments with the U. S. Department of Agriculture, 1931–36, showed that the maximum benefit from normal and higher rates of fertilizer applications can be assured by side placement from 2 to 3 in. to the side and from 2 to 3 in. below the level of the seed. Placement to one side of the seed gave practically as good results as application to both sides. With a normal or heavy fertilizer application, high in nitrogen or potassium, to avoid injury the seed should not be placed too close to the fertilizer. Preliminary results indicated that where the fertilizer is applied in bands from 5 to 6 in. apart, 3 in. below the seed, and seed planted with a walking planter, good stands and yields are obtained.

Results obtained elsewhere by the U. S. Department of Agriculture and other agencies in fertilizer placement tests with other crops are also summarized.

Cotton fertilizers for Georgia soils, R. P. Bledsoe, S. V. Stacy, and J. J. Skinner (*Georgia Sta. Bul. 196 (1937), pp. 20, figs. 5*).—Fertility experiments with cotton were made, 1928–35, in cooperation with the U. S. D. A. Bureau of Plant Industry, at five locations in Georgia on Cecil sandy clay loam, Norfolk, Orangeburg, and Carnegie sandy loams, and Decatur clay loam, typical cotton soils.

The largest returns per acre from the cotton fertilizer were obtained when the fertilizer supplied 32 lb. each of nitrogen, phosphoric acid, and potash per acre, equivalent to the application of 533 lb. of a 6–6–6 fertilizer, 76 percent of the total increase being calculated as due to the nitrogen, 8 to the phosphoric acid, and 16 percent to the potash. The results of field demonstrations on 49 farms showed that increasing the quantity of fertilizer from 13–26–13 to 30–26–30 lb. per acre was followed by increased yields of 192 lb. of seed cotton per acre and increased profits of $5.38 per acre.

Recommendations for average and special conditions in Georgia are outlined and suggestions made on buying fertilizers and fertilizer application.

A study of ammonia and nitrate nitrogen for cotton, III, IV, K. T. Holley and T. G. Dulin (*Georgia Sta. Bul. 197 (1937), pp. 24, figs. 4*).—An extension of the study of ammonia and nitrate nitrogen for cotton (E. S. R., 72, p. 38).

III. *Influence of the nitrogen concentration in the nutrient medium* (pp. 3–14).—Cotton plants grown in nutrient solutions containing high and low concentrations of nitrate nitrogen made better vegetative growth and produced slightly more bolls than those grown in comparable solutions with ammonia nitrogen. The ammonium salt solution plants tended to better fruiting in the early stages. The high concentration nitrogen solutions contained six times as much nitrogen as the low concentration media initially, but under influence of absorption by the plants the ratio increased in the later growth stages. These differences in concentration did not appreciably affect sap nitrogen or the total nitrogen percentage in the tissues of the nitrate plants in the early growth stages nor the total nitrogen of the seed at the end of the growth period. With ammonium salt solutions the higher nitrogen concentration in the medium produced plants with a higher sap nitrogen content and a higher total nitrogen content in the early growth stages and much higher content of nitrogen in the seed. The higher nitrogen content of the high ammonia nitrogen plant saps was most evident in the amide or asparagin nitrogen fraction. The nitrogen concentration in either case had no pronounced effect on the ash, calcium, magnesium, or oil content of the seed or on the iodine number of the oil.

Conclusions were that the accumulation of nitrates within the tissues is one of the principal factors governing the absorption response of the plants to variations in the concentration of nitrates in the medium, and that the increased absorption of nitrogen from the higher concentration ammonium salt solutions is in part due to the lack of appreciable accumulation of the ammonium ion in the tissues.

IV. *Influence of boron concentration* (pp. 14–23).—Although addition of 10 p. p. m. of boron, added as H_3BO_3, resulted in a decided improvement in growth of cotton plants in nitrate-nutrient solutions in spring cultures not constantly renewed, it had no appreciable effect on growth and fruiting in summer cultures receiving ammonium salts and nitrates as nitrogen sources when compared with a much lower level of added boron. The higher added boron did not appreciably affect the fruiting tendency or boll production with either nitrogen source, and did not increase the boron content of the leaves in pro-

portion to amounts added. No interrelation between boron and calcium or magnesium utilization by the plant was evident. Since the fruiting tendency of nitrate plants was nearer that of ammonia plants at both high and low added boron levels in these plants, some factor other than added boron apparently was responsible for this variation from fruiting tendencies reported previously.

In early growth stages, 10 p. p. m. added boron had no appreciable effect on nitrogen fractions of saps of plants grown on either form of nitrogen as compared with those grown on a lower boron level. From pH measurements on the expressed saps of plants of these and previous cultures, acid-base balance seemed to be maintained at about the same level in saps of plants grown on either ammonium salts or nitrates, although nitrate plants have a more basic ash. Indications were that cotton plants supplied with ammonium salts tend toward a slightly lower water content than those receiving nitrates, but there was no evidence that the source of nitrogen directly influences the water economy of the plant.

Relative value of different brands of sodium nitrate in cotton production, H. P. Cooper, E. E. Hall, W. B. Rogers, R. W. Wallace, and R. L. Smith (*South Carolina Sta. Circ. 56 (1937), pp. [4]*).—Comparative tests, 1931–35, at the station and Pee Dee and Sandhill Substations did not reveal significant differences in yields of cotton receiving equivalent amounts of ammonia from three brands of sodium nitrate.

Cotton spacing (*Alabama Sta. Circ. 76 (1937), pp. 8*).—Spacing experiments with cotton, 1924–35, at the station and substations led to the recommendation of 18 in. apart in the drill with from 1 to 3 plants per hill. Row widths with liberal fertilization may vary from 2.5 to 4.5 ft., while under low fertility conditions or with only moderate fertilizer applications row width should not exceed 3.5 ft. Of the two factors which were affected by variations in spacing, yield was influenced by variations in row width, distance between hills, and in number of plants per hill (largest yields coming from spacings giving from 8,000 to 25,000 plants per acre), and boll size was increased by wide spacings and decreased by close spacings. The optimum spacing was about the same on the different soil types on which the experiments were conducted.

Methods for the measurement of certain character properties of raw cotton, H. B. Richardson, T. L. W. Bailey, Jr., and C. M. Conrad (*U. S. Dept. Agr., Tech. Bul. 545 (1937), pp. 77, pls. 4, figs. 21*).—Detailed improvements in methods for measuring strength, fineness, and maturity of cotton fiber are described; the merits and demerits of certain procedures previously used are pointed out; and pertinent literature is reviewed.

The Chandler bundle method (E. S. R., 56, p. 496) for determining strength has been studied carefully and the technic more completely specified. Variables now controlled or corrected for include distance between threads at the center of the bundle, size of bundle, manner and amount of combing, and elongation of wrapping thread during wrapping of the bundle. The effect of sag of the bundle during wrapping is recognized and approximately evaluated. The calculation of the strength to an imaginary rod of pure cellulose has been abandoned, the results now being calculated to the area of the bundle cross section as determined by wrapping.

Improvements in the weight-per-unit-length method for estimating fiber fineness for a sample of lint include the use of entire fibers instead of cut sections, systematic sampling from all groups of fiber length in the sample, accurate weighting of the fineness in each length group in proportion to the fraction which that group contributes to the whole, and provision for a useful measure of variation of fiber fineness in the sample.

The *improvements made in the Clegg method* (E. S. R., 68, p. 282) for estimating fiber maturity in a sample of lint include a more extensive and adequate sampling process, sampling from all principal length groups of the length array, classification of fiber-wall types into two groups depending on ratio of lumen width to wall thickness, weighting of percentage of immature fibers of each group according to the fraction which that group contributes to the whole sample, and in simplification of the expression for maturity into a single figure—the immaturity count.

Soybeans: Their adaptation and production in Montana, A. H. Post (*Montana Sta. Bul. 335* (*1937*), *pp. 11*).—The behavior of soybeans in experiments under irrigation and on dry land in Montana is described, with comments on choice of varieties, and cultural and harvest practices.

Experimental results with soybeans have not been favorable for seed or hay production on either dry or irrigated land, alfalfa and annual cereal grains producing more hay per acre. Soybeans should be planted only in areas where adapted varieties of dent corn mature normally, using such early varieties as Minsoy, Wisconsin Early Black, and Mandarin for seed and these and Manchu, Chestnut, and Soysota for hay. Cultural methods similar to those used for corn and field beans are indicated.

I, Factors in soybean production; II, Variety recommendations and characteristics, R. L. Lovvorn, P. H. Kime, and R. E. Stitt (*North Carolina Sta. Agron. Inform. Circ. 102* (*1937*), *pp.* [*1*]+*6*).—Practical instructions for growing soybeans for seed, hay, soil improvement, pasture, and silage are outlined, and certain varieties indicated for various uses in different sections of the State are described briefly.

Tobacco Substation at Windsor, report for 1936, P. J. Anderson, T. R. Swanback, and O. E. Street (*Connecticut* [*New Haven*] *Sta. Bul. 391* (*1937*), *pp. 61–123, figs. 21*).—The progress of fertilizer and cultural experiments with cigar leaf tobacco (E. S. R., 76, p. 185) is reviewed as heretofore, and articles on control of diseases and insects, noted, respectively, on pages 351 and 361 of this issue, are included.

Experiments on irrigation (pp. 67–72).—Irrigation tests during several seasons on light, sandy soil with a coarse, sandy subsoil, a type that suffers from drought and from leaching, showed that if heavy irrigation is needed, application of nitrate is as important as the water. To date, no adverse effects of irrigation plus nitrates had been found on the quality or burn of tobacco, which was of unusually high quality. Experience on heavier soils at the station showed that irrigation (without addition of nitrate) could be practiced to a certain extent without serious injury from leaching. Further experimentation is deemed necessary to determine the optimum quantity of nitrate and more convenient methods of application.

Further experiments on time of harvesting Havana seed tobacco (pp. 73–75).—Results obtained so far (E. S. R., 76, p. 186) indicated that the grower will profit greatly by leaving the tobacco in the field for at least 3 weeks after topping, except when confronted with danger of leaf starvation on account of excessive rainfall, too little fertilizer, or a soil not retentive enough.

Soybean oil meal as a tobacco fertilizer (pp. 75–78).—All tobacco grown on plats with soybean oil meal as the nitrogen carrier in 1936, in comparison with cottonseed meal and general fertilizer, was excellent in quality with good color, texture, and veins. Significant differences were not apparent between yields produced by regular, pellets, or solvent process soybean oil meal, which all exceeded the checks. Nitrification studies revealed that soybean oil meal produces nitrate at a higher and more uniform rate than other organics, such as cottonseed meal, but without appreciable differences between the various

kinds of soybean oil meal tested. There was no material gain from applying soybean meal in pellet form. With shade-grown tobacco, soybean oil meal produced thinner and more elastic leaves than did cottonseed meal. In this test no increase in weight came from use of soybean oil meal, but enough improvement in quality occurred to net the dealer 9 ct. per pound above tobacco grown on the cottonseed meal formula.

Single sources versus mixed sources of nitrogen in the fertilizer (pp. 78–82).—Results over 5 yr., 1932–36, indicated that nothing is gained in yield or quality by combining several organics, a single organic giving as good results. However, indications were that the lower priced materials may well replace part or all of the more expensive ones. When potassium nitrate, supplying 40 lb. of nitrogen to the acre, was used in the fertilizer mixture as a starter, the plants did not start more rapidly nor was growth better in any way than when no nitrate was added, and furthermore, both yield and grade index were somewhat lower than when no starter was used.

Fractional applications of nitrate of soda (pp. 82–84).—Results from fractional applications of sodium nitrate were in line with those from organics, suggesting that the main, if not sole advantage of the various meals is equaled by supplying the nitrates at a proper rate. Nitrogen in sodium nitrate costs about half as much as any of the common meals, which permits a saving in fertilizer cost, but this must be balanced against the extra labor, mainly hand labor, involved in the fractional applications.

Studies on the anatomy of the tobacco leaf.—I, The midrib, P. J. Anderson (pp. 98–107).—The present description of the midrib structure considers the epidermis, including glandular hairs and stomates, chlorenchyma, cortex, endodermis, xylem, cambium, phloem, and pericycle.

Broadleaf fertilizer experiments, J. S. Owens (pp. 118–123).—Cooperative experiments with Broadleaf tobacco on Hartford sandy loam, 1931–34, 1936, in which cottonseed meal and castor pomace were about equally satisfactory when supplying four-fifths of the nitrogen applied; urea could be used to supply half the nitrogen; 150 lb. of nitrogen in the mixture about equaled 200 lb.; and from 50 to 100 lb. of phosphoric acid was adequate for most fields, did not differ greatly from experimental results obtained with Havana tobacco at Windsor. Thus, it appeared that Broadleaf growers may safely use results from the fertilizer tests at Windsor as a basis for their own practices.

Inspection of agricultural seeds, H. R. Kraybill et al. (*Indiana Sta. Circ. 225 (1936), pp. 110, fig. 1*).—The purity, percentages of germination, and weed seed content, and for legumes hard seed content, are tabulated from tests of 1,362 official samples of seed collected from dealers in Indiana during the year ended June 30, 1936.

Seed inspection, F. A. McLaughlin (*Massachusetts Sta. Control. Ser. Bul. 86 (1936), pp. 81*).—The purity, germination, and weed seed contents are tabulated for 206 official samples of field crop seed and germination for 532 samples of vegetable seed collected in Massachusetts during the year ended October 1, 1936. Results of field tests for trueness to type and variety on 135 lots of beans, beets, cabbage, carrots, lettuce, onions, parsnips, radish, spinach, squash, and turnips are included, with remarks on the quality of onion seed produced in the Connecticut Valley in the 1935 season. Studies of flower seeds made in cooperation with O. M. Hoefle and C. L. Thayer, including tests of 104 samples of seed for purity, germination, and performance, are appended.

The herbicidal properties of boron compounds, A. S. Crafts and R. N. Raynor (*Hilgardia [California Sta.], 10 (1936), No. 10, pp. 343–374, figs. 7*).—Greenhouse studies on the toxicity and fixing of borax in Yolo clay loam, Stockton adobe clay, Fresno sandy loam, and Columbia fine sandy loam were supple-

mented by plat tests with borax and other boron carriers, dry and in solution, and in mixture with sodium chlorate and arsenicals.

High toxicity indicated in the greenhouse tests was less evident in the field, and the boron compounds were not retained in the soil against the leaching power of moving water to the same extent as arsenic. Consequently, applications must be heavy and often for complete sterilization. Borax loses rapidly in toxicity when held in a given mass of soil, and this action together with the loss by leaching reduces the effective concentration until seedlings are permitted to develop. Indications were that the use of boron in soil sterilization will be limited both by species present on the areas and the amount and distribution of seasonal rains.

Klamath weed is injured by high concentrations of salts in the soil solution and is highly susceptible to boron poisoning. Against more tolerant plants and in regions of fertile, recent alluvial soils, use of boron compounds seems limited to the coarser soils or graveled areas; and where annual rainfall exceeds 10 in., applications will be needed one or more times each year. It is emphasized that boron compounds must be used with caution near ornamental plants, around orchards or groves of citrus and walnuts, and in regions where a possibility of contamination of irrigation water supplies exists.

Response of quack grass to defoliation and fertilization, S. T. Dexter (*Plant Physiol., 11 (1936), No. 4, pp. 843–851; abs. in Michigan Sta. Quart. Bul. 19 (1937), No. 3, pp. 193, 194*).—Quackgrass in field plats and in the greenhouse received ammonium sulfate and other fertilizers. Frequent and complete defoliations killed both fertilized and unfertilized plants, but fertilized plants were weakened more rapidly in the early stages. Rhizomes taken from plants at various times throughout the spring and placed in a seed germinator decreased in ability to sprout as summer approached. Rhizomes from fertilized plants sprouted much more quickly and vigorously than those of unfertilized plants, which tended to remain vegetatively inactive.

On eradication plats, grass plowed at early bloom was killed more easily than that plowed either earlier or later. Fertilized grass always grew more rapidly at first after plowing, but was weaker than the unfertilized grass after being hoed off once or twice. Rhizomes of quackgrass that had been heavily fertilized with ammonium sulfate contained 2 or 3 times as much nitrogen as those from unfertilized grass. Fertilized rhizomes also produced new sprouts within a few weeks that weighed about 10 times as much and contained about 20 times as much nitrogen as sprouts from similar unfertilized rhizomes. The draft on the fertilized rhizomes for organic foods was far greater than in the case of unfertilized rhizomes. Quackgrass responded to nitrogen fertilization by producing greater top growth which was higher in nitrogen than grass from unfertilized plats.

HORTICULTURE

[Horticultural investigations by the Indiana Station] (*Indiana Sta. Rpt. 1936, pp. 49–56, 65, 66, 67, figs. 7*).—Among studies the results of which are briefly outlined are orchard soil management; apple pruning; spraying materials, equipment, and residue removal; varieties of peaches and plums; storage of apples; production of tomato seed; relation of nutrition and healthy foliage to quality in the tomato; correlation between the refractive index and sugar content in the muskmelon; manurial substitutes in greenhouse soils for roses and injurious effect of corrosive sublimate; storing, precooling, and freezing of fruits and vegetables; supplemental lighting in the greenhouse; growing of pyrethrum and determination of its pyrethrin content; effect of cultural treatment on growth and reproduction in the apple; and chemical studies on the quality of inbred and pure lines of sweet corn.

[Horticultural studies by the Tennessee Station] B. D. DRAIN and L. A. FISTER (*Tennessee Sta. Rpt. 1936, pp. 44–47, 48, 52, 53, 54, 55, 64–66, 68, figs. 8*).—Included are reports on projects in red raspberry and pyrethrum improvement; the development of fire blight-resistant pears, leaf spot-resistant tomatoes, and blight-resistant chestnuts; irrigation of vegetables; breeding of sweet corn; testing of ornamentals; mulching of red raspberries; soil reaction needs of flowering shrubs; fertilizers for young orchards; testing of new varieties of peaches and of early cabbages; and general notes on variety and cultural tests with asparagus, grapes, gooseberries, and plums.

[Horticultural studies by the Washington Station] (*Washington Sta. Bul. 342 (1936), pp. 22, 43, 44, 45–49, 61, 62–64, 67, 68*).—Included are brief progress reports on the characteristics of maturing apples, by J. L. St. John; orchard cover crops, by O. M. Morris and F. L. Overley; peach harvesting, packing, and storing, by Morris; development of methods of propagating apple stock, by Morris; types and extent of winter injury, pollination of the apple, and effects of oil sprays on apple trees, all by E. L. Overholser and Overley; breeding strawberries, by C. D. Schwartze; fertilizer treatments for the orchard, by Overholser, Overley, and W. J. Clore; breeding raspberries for hardiness and disease resistance, by Schwartze and G. A. Huber; orchard irrigation, by Overholser and Clore; and tomato breeding, by C. L. Vincent.

Among studies reported from the Irrigation Substation are tests of sweet corn hybrids, by H. P. Singleton; soil moisture relationships in orchards, by C. A. Larson; response of apples to irrigation, control of fire blight in pears, varietal susceptibility of plums to winter injury, and variety trials of apples, peaches, and cherries, all by Clore.

Among projects of the Cranberry-Blueberry Substation discussed are weed control in cranberry bogs and fertilizers for blueberries, both by D. J. Crowley.

Carbon dioxide exchange rhythm and fruitfulness in plants of different reproductive habits, R. H. ROBERTS, J. E. KRAUS, and N. LIVINGSTON (*Jour. Agr. Res. [U. S.], 54 (1937), No. 5, pp. 319–343, figs. 28*).—Employing large chambers approximately 30 cu. ft. in volume which permitted the use of entire potted plants of various species, such as the apple, potato, tobacco, buckwheat, and poinsettia, the Wisconsin Experiment Station found that blossoming plants have a more irregular curve of carbon dioxide exchange than do nonblooming plants. The authors suggest that carbon dioxide exchange is affected, probably, by the anatomical development that takes place and is related to reproduction merely because a correlation exists between anatomical conditions and fruitfulness. In certain plants such as spinach and tobacco, in which there was relatively little difference in the carbon dioxide utilization in blooming and nonblooming plants, there was also relatively little difference in anatomical character with blooming.

The failure of additional light to alter appreciably the diurnal carbon dioxide exchange curve, while it altered greatly the reproductive status, raises the question whether photoperiodism is not due to photochemical processes other than photosynthesis. The fact that the type of carbon dioxide utilization curve is correlated with the reproductive state of the plant is believed to indicate that a common physiological condition exists in all the reproductive plants studied.

The influence of rate of thawing on freezing injury of apples, potatoes, and onions, J. M. LUTZ (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 227–233, figs. 9*).—In these studies potatoes, onions, and apples were generally more severely injured with rapid than with slow thawing. With the onion and the apple the differences in injury were not especially pronounced until very rapid thawing such as occurs in water or in air at 95° F. was employed. Injury

was less in apples when the fruit was removed from the thawing medium promptly after thawing than when allowed to remain for some hours. A thawing temperature of about 40° adjacent to the frozen product is considered to be desirable for apples, potatoes, and onions under commercial conditions.

Synthetic manure-heated hotbeds, E. F. Burk (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 603, 604, fig. 1*).—At the Oklahoma Experiment Station, hotbeds heated by a mixture of 7 lb. of calcium cyanamide with 100 lb. of prairie hay, straw, cotton burs, Bermuda grass, and weeds compared favorably with horse manure in efficiency. Treated cotton burs gave a higher temperature than horse manure and prairie grass an equal temperature. An advantage for calcium cyanamide was that the nitrogen formed NH_3, which did not leach readily, and the calcium formed calcium carbonate, which favored alkalinity.

[Vegetable crop studies by the Illinois Station] (*Illinois Sta. Rpt. 1935, pp. 265–280, 281, 282, figs. 2*).—Included are brief reports on studies of the fertilization of truck crops, cover crops as a source of organic matter for truck gardens, time and extent of cutting asparagus plantings, fertilizers for asparagus, and varieties of tomatoes for canning, all by J. W. Lloyd and J. P. McCollum; breeding and testing of sweet corn hybrids, rate and method of planting sweet corn, fertilizers for sweet corn, and breeding of new tomatoes (for canning purposes) and lima beans, all by W. A. Huelsen; fertilizers for greenhouse tomatoes, by Lloyd; factors associated with the premature seeding of onions, by McCollum; and factors affecting the production of horseradish, by Lloyd, McCollum, and Kadow.

Floral primordia differentiation in beet and turnip, R. L. Carolus (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 518–522, figs. 8*).—Detroit Dark Red beets harvested November 23 and replanted in a warm greenhouse after one month's storage at 55° to 65° F. produced noticeable flower stalks in only 50 percent of the plants after 3.5 mo. In contrast, beets held 1 mo. at 32° to 40° produced 100 percent flower stalks in the same period. Cold storage for 3 to 4 mo. resulted in strong seed stalk development in both beets and turnips, but it was not determined whether this improved growth was due to stimulation of low temperature or the superior preservation of the mother roots. In turnips, completely differentiated raceme primordia were found in roots stored 1 mo. under either cold or common storage. In beets, no flower stalk primordia were found in roots stored only 1 mo., showing that beets require a comparatively longer period of rest than turnips to cause initiation of flower development.

Statistical studies of apparently uniform fields of carrots and onions on peat soils, J. H. Beattie and V. R. Boswell (*Amer. Soc. Hort. Sci. Proc., 32 (1935), p. 472*).—An analysis of records taken by the U. S. Department of Agriculture in plats established in six fields showed in five cases a high to very high noncorrelated variation in yield and a very low correlated variation. In general, multiple-row plats were less variable than single-row plats of equal area. Increase in plat size from 10 to 100 ft. of row in most cases resulted in a relative decrease of 40 to 60 percent in interaction variance and distinctly less decrease in total variance. The conclusion is reached that machine methods of planting and culture do not in themselves insure sufficiently uniform small plats to permit distinction of small differences without an inconveniently large number of replications.

Spacing studies with asparagus on a peat-sediment soil, G. C. Hanna (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 600–602*).—Mary Washington asparagus planted in 1930 in rows 7.5 ft. apart with plants 12, 18, 24, 30, and 36 in.

in the row, in 1932 yielded 1,851, 1,483, 1,314, 1,009, and 901 lb. of green asparagus, respectively, and over the 4-yr. period 1932–35, yielded 16,400, 13,773, 12,650, 10,900, and 9,464 lb. There was very little difference in the average weight of spears between the various spacings. Although there was a progressive increase in the average number of spears per crown as spacing increased, the gain did not compensate for the smaller number of crowns per acre.

The development of early stringless beans by hybridization and selection, J. M. Jenkins, Jr. (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 515–517*).—Tennessee Green Pod, found to be the earliest and most productive bean under South Carolina conditions but possessing various undesirable characters, was crossed by the South Carolina Experiment Station with various commercial varieties. Beginning with the F_3 generation, plants which flowered about the same time as the Tennessee parent were saved. Of these several bore stringless fairly smooth pods. Further trial is required to determine disease resistance and yielding capacity, but the study had progressed sufficiently to show the possibility of developing early bean varieties by crossing commercial types with an unusually early kind.

Physiological factors associated with the fruiting habits of the bush lima bean, F. S. Andrews (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 473–476*).—In 1935, plantings of Fordhook and Woods Prolific lima beans were made by the South Carolina Experiment Station on May 3 and July 15. The Woods Prolific greatly outyielded the Fordhook in both plantings. Stomatal activity was markedly different in the two varieties, the stomata of the Woods Prolific opening usually 20 to 40 min. earlier in the morning and closing 1 to 4 hr. later in the afternoon. The Woods Prolific had a greater chlorophyll content, a greater osmotic pressure of the leaf sap, a greater carbohydrate content, a lesser nitrogen content, and a greater carbohydrate-nitrogen ratio. Apparently stomatal behavior and chlorophyll content were very important factors in the different yielding capacities of these two varieties.

Variation in soluble solids within individual fruits of the cantaloupe and related melons, G. W. Scott (*Amer. Soc. Hort. Sci. Proc., 32 (1935), p. 523*).—Measurements taken by the California Experiment Station at Davis with a Zeiss hand refractometer on the expressed juice from different parts of cantaloups and watermelons showed the stem end to be lower than the blossom end in soluble solids. Sometimes this difference was as much as 3 to 4 percent. Usually there was a gradual increment along a horizontal plane from the stem to the blossom end. The soluble solids were higher in the flesh near the seed cavity than near the rind, but the differences were not large in fully ripened fruits. Determinations agreed rather closely with those made by a Brix hydrometer.

Plot technique in field celery experiments, D. Comin (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 524–527*).—Based on analysis of records taken on plats laid out in a celery field located on muck soil in Portage County, the Ohio Experiment Station found that with standard errors of 10-plant units before and after the effect of soil heterogeneity was removed estimated at 11.18±2.15 and 11.18±1.75, respectively, approximately 100 celery plants were required to measure differences of 5 percent within an area of 1/12 of an acre and 148 plants within an area of 1/6 of an acre. Differences of 14 percent between any two plats were required for significance. The coefficient of variability of weight was the same before and after trimming the plants. Adjusting the plat yields to the yield of the normal stand by means of the platted regression resulted in no improvement as revealed by Fisher's analysis of variance.

[Pomological studies conducted by the Illinois Station] (*Illinois Sta. Rpt. 1935, pp. 242–250, 251–255, 256–260, 261, 262, 264, 265, fig. 1*).—Herein is briefly presented the progress of investigations in apple and peach breeding, by J. C. Blair, M. J. Dorsey, and J. S. Whitmire; pruning of the apple, by W. A. Ruth and V. W. Kelley; sources of nitrogen for apples, by Dorsey, R. S. Marsh, and Ruth; apple spraying, by H. W. Anderson; spray residue removal, by Ruth and K. J. Kadow; development of pears resistant to fire blight, by Anderson; cover crops for orchards, by Dorsey and Ruth; fertilizers for the peach, thinning peach fruits, and time of picking as related to quality of peaches, all by Dorsey and R. L. McMunn; zinc sulfate as a corrective for arsenical injury to the peach, by Anderson; selection of orchard sites, by Dorsey and Anderson; varieties of plums, by McMunn; rootstocks for cherries, by Dorsey and McMunn; varieties of small fruits and nuts, time of pruning grapes, and breeding of raspberries, all by A. S. Colby; and spraying the red raspberry to increase winter hardiness, by Anderson and Kadow.

Three distinct types of winter injury in trunks of fruit trees, F. C. Bradford (*Michigan Sta. Quart. Bul., 19 (1937), No. 3, pp. 179–182, figs. 2*).—Descriptions are presented of three different types of winter injury with suggestions for remedial treatments.

The seasonal course of soluble nitrogen and phosphate phosphorus in the shoot growth of Winesap apple and Elberta peach, C. S. Waltman (*Kentucky Sta. Bul. 367 (1936), pp. 157–191, figs. 18*).—Employing a modification of the Emmert procedure (E. S. R., 73, p. 583), determinations were made of the percentage of soluble nitrogen and phosphate phosphorus in samples of Winesap apple and Elberta peach shoots collected at weekly intervals throughout approximately a year from trees receiving different fertilizer and cultural treatments. With the peach the mean of soluble nitrogen for the dormant period was somewhat greater in three of five treatments than during the growing season. In the apple the percentage of soluble nitrogen was much lower in winter than in summer. During late summer and fall soluble nitrogen percentage was much higher in the peach than in the apple. The percentages of phosphate phosphorus in the shoots of apple were maintained at nearly the same level throughout the year with a similar relationship in the peach. In general, as soluble nitrogen increased, phosphate phosphorus decreased and vice versa. Precipitation influenced the accumulation of soluble nitrogen presumably by its influence on utilization in growth. This influence was much more pronounced in the peach than in the apple. Fertilizer treatments had no significant effect on the soluble nitrogen in peach trees either in summer or winter. The low percentage of soluble nitrogen in the shoots of apple trees in bluegrass sod suggested an association between the lack of available nitrogen and poor growth. Shoots from apples from the plats where millet and barley were used as cover crops averaged fully as high in percentage of soluble nitrogen as did those from trees where sweetclover and soybeans were grown.

The relation of nitrogen and soil moisture to growth and fruitfulness of apple trees under different systems of soil management, C. E. Baker (*Indiana Sta. Bul. 414 (1936), pp. 36, figs. 12*).—Studies in a Grimes Golden and Delicious apple orchard planted in the fall of 1922 with differential treatments beginning in the spring of 1925 indicated the importance of soil management systems that increase or maintain the soil organic matter. Nitrate nitrogen content in the soil could not be correlated with tree behavior since considerable amounts were found in tilled soil receiving nitrogen fertilizer but with trees making poor growth. On the other hand, nitrates were seldom found under nitrogen-fertilized bluegrass sod or under a legume sod

in which the trees made satisfacstory growth and yields. Total nitrogen was highest in soils receiving annual applications of a nitrogen fertilizer, except in the unfertilized legume plat where the soil was well supplied with organic matter. Nearly twice as much total nitrogen was found in the upper 8 in. of soil in all plats as in the 8–24 in. level. The unfertilized cultivated plat was lowest in total nitrogen. Trunk girth increment, terminal growth, leaf size, weight and thickness, fruit set, total yield, and size of fruit were directly correlated with total nitrogen in the soil and with an abundant nitrogen supply in the tree during the season of 1935.

During severely dry periods soil moisture was highest in soils containing the most organic matter. Heavy run-off, accompanied by serious erosion, occurred on tilled soils low in organic matter. Without nitrogen fertilizer it was not possible after 12 yr. of tillage and fall-sown crops of wheat or rye to secure even a moderate cover-crop growth. In 1935 the largest yields as well as the largest and most attractive Grimes apples, were produced on trees in permanent bluegrass receiving nitrogen. In the Delicious variety in 1935 the cultivated plats receiving nitrogen produced the highest total yield and smallest fruits. Despite the lesser yields, the fruit from the fertilized bluegrass and the legume plats was larger, more attractive, and of more economic value. In both varieties the fruit from the bluegrass and legume plats kept in good condition in cold storage longer than did the small fruits from the tilled areas.

Stock and cion effects in topworked apple trees, T. J. Maney, H. H. Plagge, and B. S. Pickett (*Amer. Soc. Hort. Sci., Proc., 32 (1935), pp. 332–335, fig. 1*).—In an experiment at the Iowa Experiment Station in which an orchard was established in 1930 with trees budded on roots of known varieties, on French crab, and on Hibernal and Virginia crab intermediates with French crab roots, it was observed that although the rootstocks had a rather distinct effect on the growth of the top, variability was not reduced materially by any set of stocks. In growing seedlings from open-pollinated seed, the parents influenced definitely the vigor of the progeny. When budded to a recognized variety, the vigorous seedlings produced the better trees. In trees limb budded on Hibernal and Virginia crab there was less variability in the scion varieties on Virginia crab than on Hibernal, indicatng that the intermediate stock had greatly influenced the uniformity of the trees and, in the authors' opinion, had an effect equal to, if not greater, than what could be expected with own-rooted trees.

Bridge-grafting vs. cleft-grafting girdled young apple trees, T. A. Merrill (*Michigan Sta. Quart. Bul., 19 (1937), No. 3, pp. 175–177, figs. 2*).—Based on observations on the recovery of apple trees injured by mice or rabbits, the author suggests the desirability of handling young trees less than 2 in. in diameter by cutting off the entire top below the girdling wounds and inserting scions by the cleftgraft method. Young trees treated in this manner made greater growth in the following years than comparable bridgegrafted trees, but there was danger of winter injury to the new tops because of their extremely rapid growth the first year or two after grafting.

The effect of lime-sulphur spray on the respiration rate of apple leaves, M. B. Hoffman (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 173–176*).—Having shown previously (E. S. R., 72, p. 619) that lime-sulfur sprays may decrease the rate of apparent photosynthesis of apple leaves, the author investigated the possibility that spraying with lime-sulfur may have increased the respiration rate, thereby supplying additional quantities of carbon dioxide for a normally functioning photosynthetic process. In the experiment, certain leaves

of young Baldwin trees, after running preliminary tests, were enclosed in black paper envelopes. There was some indication that the sprayed leaves respired at a slightly greater rate than the untreated, but in no measure was this sufficient to compensate for the decrease in the rate of apparent photosynthesis as recorded before covering with black paper. A second experiment gave the same general results, leading to the deduction that one is justified in concluding that lime-sulfur injury to apple leaves is due largely to the decrease in the rate of photosynthesis rather than to an increased rate of respiration.

The effect of bordeaux, copper, and calcium sprays upon carbon dioxide intake of Delicious apples leaves, W. J. Clore (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 177–179, fig. 1*).—Leaves of young Delicious apple trees growing in the greenhouses of the Washington Experiment Station were, after three days' preliminary readings with a modified Heinicke and Hoffman apparatus, sprayed with bordeaux mixture, copper sulfate, and hydrated lime. In general, the assimilation averages of treated and untreated leaves checked fairly closely with the exception of the calcium group, in which carbon dioxide undoubtedly was markedly decreased. Certain of the calcium-sprayed leaves showed distinct injury, first indicated at the extreme tips of the leaf blades. The only true symptom of bordeaux injury was seen on leaves sprayed only with copper sulfate.

Some notes on spray injury, H. G. Swartwout (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 180–182*).—Stating that spray injury in Missouri was more severe in 1935 than for many years, the author presents certain observations. On eight apple varieties, lead arsenate alone caused some russeting but less in all cases than when combined with lime-sulfur. Rome Beauty was exceptionally resistant to russeting. Reducing the concentration of lime-sulfur below the usual dilution without reducing the lead arsenate resulted usually in a better finish to the fruits. In combination with lead arsenate, dry lime-sulfur caused less russeting than did liquid lime-sulfur. In field tests, calcium caseinate failed to reduce russeting in the lime-sulfur lead-arsenate mixture. The zinc sulfate-hydrated lime mixture which has proved effective in reducing arsenical injury to peaches caused injury to apples.

Boron content of apples at different stages of development, J. C. Johnson and W. A. DeLong (*Plant Physiol., 12 (1937), No. 1, pp. 219, 220*).—Analysis of Golden Russet apples collected from a manure-fertilized orchard located on a sandy loam soil indicated that in healthy fruits the boron content increases progressively throughout the season. The increase was relatively very rapid during the period of active cell division and of rapid growth in the month of June, suggesting the apparent importance of boron during the period of rapid growth of the fruit. The epidermal tissues (parings) were only slightly higher in boron than was the flesh.

A rapid method for determining the germinative power of peach seeds, F. Flemion (*Contrib. Boyce Thompson Inst., 8 (1936), No. 4, pp. 289–293, fig. 1*).—A simple method of determining the viability of peach seeds is outlined in which the naked embryos were mixed with granulated peat moss and held at room temperature. In 5 to 7 days at 20° to 25° C. the viable seeds showed hypocotyl development, and by 10 days all embryos were growing or showing deterioration. The percentage germination compared favorably with that secured when seeds were afterripened at 5° to 10° for the usual germination tests.

Bridge-grafting the peach, S. Johnston (*Michigan Sta. Quart. Bul., 19 (1937), No. 3, pp. 177–179, fig. 1*).—Elberta peach and Burbank and Lombard plum scions were used in an attempt to save mice-girdled 3-year-old peach trees. The results were that all the peach scions failed, 3 of 14 Burbank plum scions

lived, and 21 of 27 Lombard scions grew satisfactorily. However, where girdling was complete the trees did not recover even with bridgegrafting, indicating doubtful value of the operation with peach trees.

Some varietal differences in fruit development in peaches, R. V. Lott and T. E. Ashley (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 258–264, fig. 1*).—In this further contribution (E. S. R., 72, p. 189), the authors present data on five peaches, Mayflower, Early Rose, Carman, Hiley, and Elberta, ranging in growing season from 62 to 129 days. In general, it was found that the first growth stage of the fruit, that is, up to the time the stone was hard enough to separate from the flesh, was much the same in all five peaches but thereafter the early maturing varieties proceeded to develop much more rapidly. The earliest variety, Mayflower, increased in dry weight of stone only 0.86 g from the beginning of the second growth stage to final maturity, while the stone of Elberta, the latest variety, gained 4.9 g up to the time of its maximum dry weight. The stones of the Mayflower peach never became completely hard, and the cotyledons developed only enough to half-fill the integuments when the flesh was mature. The other three varieties attained intermediate positions. Ether extract of the kernels of Mayflower and Elberta when the flesh was ripe were 0.34 and 30.84 percent, respectively. Apparently in late peaches such as Elberta, carbohydrates were used in the intermediate stages to develop greater dry weight of stone and kernel rather than flesh.

***Peach tree fertilization*, F. F. Cowart and H. L. Cochran** (*Com. Fert., 54 (1937), No. 1, pp. 15, 16*).—Yield records taken in 1936 in a differential fertilizer experiment, conducted by the Georgia Experiment Station and the U. S. Department of Agriculture in an Elberta peach orchard planted in 1929, indicated that the application of 6 lb. per tree of a 4–8–6 fertilizer in the spring supplemented by an additional pound of nitrate of soda on June 1 was the most profitable treatment. The date of the heaviest picking was deferred as much as 4 days by fertilizer treatment beyond that of the nonfertilized trees. Color was adequate on all plats except those receiving 8 or 12 percent nitrogen. Trees receiving phosphorus and potassium but no nitrogen yielded no more fruit than the unfertilized trees.

Further observations on the relation of zinc sulfate on the control of arsenical injury on the peach, R. F. Poole (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 183–185*).—In 1935 when a protracted drought ended July 1 and was followed by a month of heavy rains and much cloudiness, the greatest arsenical injury in 8 yr. was recorded. In many cases, the fruits either decayed entirely or became worthless. Zinc sulfate added to the regular arsenate of lead and lime mixture reduced injury only slightly and was less effective than certain other amendments. Leaves and buds were not injured at any time during the season, and the trees held their foliage better than usual. Fruit injury did not appear where basic lead arsenate, 3 lb. to 100 gal. of water, was used.

Carotenoids of the peach, G. Mackinney (*Plant Physiol., 12 (1937), No. 1, pp. 216–218*).—Studies at the University of California with powdered vacuum-dried Muir peaches and dried Lovell peaches indicated that the carotenoid fraction of the peach contains at least eight components, the four most abundant being β-carotene, cryptoxanthin, lutein, and zeaxanthin. Only a faint trace of α-carotene and none of lycopene or γ-carotene was found.

Seasonal influences upon the effect of shading in regard to setting of sour cherry fruits, L. R. Langford (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 234–236*).—In studies conducted by the Wisconsin Experiment Station, coverings of burlap, cheesecloth, and muslin placed over 8- to 12-year-old Montmorency cherry trees following the full-blossom stage and retained for about 3 weeks resulted in all cases in a smaller percentage set of fruits. The effects

varied from year to year and with the type of cloth. Certain uncovered trees supplied with supplementary electric light showed a slight increase in set. The greater drop of fruit from the shaded trees is believed due to a lack of available synthesized foods. There was some indication that temperature may have some effect on fruit setting other than its influence on pollination.

Additional notes on sweet cherry doubling, L. R. TUCKER (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 237–239, figs. 2*).—Following an earlier paper (E. S. R., 75, p. 489), the author reports that double fruits occurred in 1935 in approximately the same amount as in 1932. As to the localization of doubling, 61 percent of the flowers from the buds on the top of limbs growing approximately horizontally on the southern exposure had double pistils while only 14 percent from the bottom quarter and 34 percent on both the eastern and western exposures were doubled. Light or temperature, or both, were apparently concerned in malformation. A study of temperature records at Lewiston showed high temperature periods in June of 1931 and 1934, the years preceding the large occurrences of double fruits, but unfortunately the periods did not coincide.

The origin of roots in several types of red and black raspberry stem cuttings, R. H. SUDDS (*Amer. Soc. Hort. Sci. Proc., 32 (1935), pp. 380–385, fig. 1*).—Following an earlier paper (E. S. R., 74, p. 344) dealing with the origin of roots in tip-layered plants of the Cumberland black raspberry, the author discusses the results of studies on other types of root development. In leaf-budded cuttings of the black raspberry, practically all the roots pushed out parallel to the epidermis and tangentially through the cortex, lifting the epidermal and collenchymatous tissues near the edges of the shield. In single-eye hardwood cuttings of Cumberland, the formation of roots was limited in all but two cases to the axillary buds. In softwood tip cuttings of Latham red raspberry, the root primordia arose in the primary rays beside certain vascular bundles which were readily distinguishable as leaf traces comprising the vascular supply of the leaves formerly in the nodes immediately above. Preceding or accompanying the appearance of the root primordia, there was a considerable amount of pericyclic activity not evident to any such degree in the black raspberry.

Raspberry nutrition.—II, Causes of raspberry failures in the coastal area of British Columbia, G. H. HARRIS (*Sci. Agr., 16 (1936), No. 7, pp. 353–357, fig. 1; Fr. abs., p. 357*).—In this second contribution (E. S. R., 73, p. 480), the author reports that most soil samples obtained from raspberry plantings have shown a nitrate value far below the optimum. Lime was also often deficient, and many low-yielding plants showed a phosphorus deficiency. Phosphates should be applied preferably a year or so in advance of lime because of a tendency of the two materials to form insoluble compounds. Potash in available form may run low in raspberry plantings, and sometimes its lack may be offset by applications of nitrate of soda, the sodium apparently replacing the potassium in the soil complex. Soil acidity is not considered necessarily harmful in itself but often results in reducing the availability of essential nutrients. Lime is sometimes required to render aluminum insoluble. Poor drainage often interferes with healthy root development.

Nitrogen in relation to the growth of citrus cuttings in solution cultures, A. R. C. HAAS (*Plant Physiol., 12 (1937), No. 1, pp. 163–172, figs. 5*).—Following an earlier paper on phosphorus relations (E. S. R., 75, p. 631), the author presents the results of a preliminary study of the growth of citrus cuttings in solution cultures containing various forms and concentrations of nitrogen. When the culture solution was not renewed, nitrogen was the first element to become depleted. The roots became gelatinous and bluish in color, and a

strong odor of decomposing root tissue was evident. The tops showed no immediate effect, although there was a gradual loss of leaves. When calcium nitrate was added, the odor disappeared overnight and within a few days new roots were seen. The tops of Lisbon lemon cuttings grown in solutions with ammonia as the only source of nitrogen were larger with increasing concentrations of ammonia, but the leaves had the appearance of needing nitrogen. Concentrations of nitrite above 5 p. p. m. in the culture solution that contained 785 p. p. m. of nitrate were distinctly injurious to Lisbon lemon and Valencia orange cuttings.

[Floricultural studies by the Illinois Station] (*Illinois Sta. Rpt. 1935, pp. 282–288, fig. 1*).—Included are reports on progress of studies on the maintenance of fertility in greenhouse soils, by F. F. Weinard; classification and nomenclature of peonies, by Weinard and H. B. Dorner; and methods of cutting peony blooms, control of split calyx in carnations, rose varieties for forcing, and the spacing of carnation plants, all by Weinard.

Germination and seedling production in Lilium sp., L. V. Barton (*Contrib. Boyce Thompson Inst., 8 (1936), No. 4, pp. 297–309, fig. 1*).—Recounting the advantages of producing lilies from seed, among them the securing of mosaic-free plants, the author discusses the results of studies with *L. auratum*, *L. canadense*, *L. japonicum*, *L. rubellum*, *L. superbum*, and *L. szovitsianum*. It was found that all these species require from 3 to 6 mo. at a high temperature of about 20° C. (68° F.) for the initiation and growth of the root, which is nondominant. After root growth began, a period of from 6 weeks to 3 mo. at a low temperature of from 1° to 10° was required before the dominant first leaves began their development. The results indicate the desirability of spring or summer planting out of doors, and wherever late fall and winter planting was not harmful the date had no effect. Tests on seeds of *L. concolor* showed prompt growth of both roots and cotyledon.

Fragrance in the garden, A. Dorrance (*Garden City, N. Y.: Doubleday, Doran & Co., 1937, pp. 96, [figs. 10]*).—For the most part this book is devoted to the fragrance-supplying qualities of various ornamental plants.

Herbs and herb gardening, E. S. Rohde (*London: Medici Soc., Ltd., 1936, pp. XIII+206, pls. [15, figs. 34]*).—This popular treatise is devoted to the making of an herb garden and the use of herbs as ornamental plants.

Roadsides: The front yard of the Nation, J. M. Bennett (*Boston: Stratford Co., [1936], pp. [XVIII]+233, pls. [18]*).—This is a general discussion devoted largely to plant material and its utilization.

FORESTRY

[Forestry studies by the Indiana Station] (*Indiana Sta. Rpt. 1936, pp. 45–47, figs. 2*).—Brief reports are presented on the marketing of basket veneer and handle stock, wood lot management, the control of weed growth in nursery beds, and the possibility of transplanting one year Chinese arborvitae seedlings.

Effect of climate on timber-growth fluctuations, F. X. Schumacher and H. A. Meyer (*Jour. Agr. Res. [U. S.], 54 (1937), No. 2, pp. 79–107, figs. 10*).—Annual ring widths from 1864 to 1926 of 12 dominant *Abies alba* sample trees taken from a 120-year-old stand of fir-spruce-beech near Aarau, Switzerland, were used to arrive at an estimate of the variation in annual ring width that is independent of the individuality of the tree and the effect of age. This magnitude, assigned to fluctuations of weather and climate, gives a coefficient of variation of 15.4 percent of the general average ring width of the data.

In an attempt to find out the part that one meteorological factor, precipitation, exerted on the widths of tree rings, orthogonal polynomials were fitted

to monthly precipitation for (1) each 13-mo. period, from August 1 of a preceding year to August 31 of a "current" year; and (2) each 15-mo. period from June 1 of a preceding year to August 31 of a current year. Progression equations, expressing the effect of variation in these polynomial coefficients on variation in ring width for corresponding current years, were transformed into functions which express the average effect of an added centimeter of rainfall per month during the 13-mo. (or 15-mo.) periods on width of annual ring. As a result, the simultaneous effect of precipitation upon the width of the current and succeeding annual ring is presented, indicating that precipitation exerts a permanent influence on next year's growth at about the same time (early July) that its influence on this year's growth passes its maximum, and reaches its own maximum, in turn, at the end of this year's growing season. From August on, the influence of precipitation on next year's annual ring width continues, although at a lessened rate.

DISEASES OF PLANTS

Some effects of plant diseases on variability of yields, C. Hartley and A. Rathbun-Gravatt (*Phytopathology, 27 (1937), No. 2, pp. 159–171, figs. 3*).—Examples of the effects of a single disease and of combinations of diseases on the variability of regional yields are analyzed. "Diseases may, in general, be expected to increase variation in production. The larger the variation of the disease losses or the more the disease losses tend to occur at times when other injurious factors also are active, the greater is the increase they produce in the variation of yields. Some diseases, however, are most serious in years otherwise favorable to the crop. Such diseases, if the loss variation is not too large, actually may decrease the variation in annual yields of a region as a whole. Late blight of potatoes appears to have become such a case—once a prime source of uncertainty, causing one of the great famines of history, and still a source of expense and worry to the individual farmer, it has been reduced to an apparently stabilizing factor, so far as regional and national yields are concerned and so long as the recommended spraying schedules are maintained.

"Stabilizing the yields of the individual grower is more essential from the standpoint of the producer than stabilizing regional yields. Disease losses to local communities or individual growers are more variable than regional losses, and diseases are, therefore, more likely to increase the variability of local yields than of regional yields.

"In the choice of problems for investigative emphasis, it is suggested that when other considerations are equal those diseases are particularly in need of attention, from the standpoint of both producer and consumer, in which variation is large or is negatively correlated with annual yields, so that better control will reduce yield variation."

The physiology of host-parasite relations, W. Brown (*Bot. Rev., 2 (1936), No. 5, pp. 236–281*).—Following a general introductory section, the bulk of this review discusses the stages of parasitism and the facultative and obligate parasites. Brief notice is given to acquired immunity in plants, and a bibliography of 149 titles is included.

Some aspects of the plant disease eradication and control work of the Bureau of Entomology and Plant Quarantine (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1937, Sup. 99, pp. 17–46*).—The following papers are included: The Dutch elm disease eradication program—objectives, methods, and results, by O. N. Liming; white pine blister rust control and barberry

eradication in 1936, by S. B. Fracker; barberry eradication developments; and control of phony peach disease, citrus canker eradication, and eradication of the peach mosaic disease, all by B. M. Gaddis.

The Plant Disease Reporter, April 15, May 1, and May 15, 1937 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 21 (1937), Nos. 7, pp. 111–127, figs. 3; 8, pp. 129–142; 9, pp. 143–178, figs. 3*).—The following items of interest are included:

No. 7.—Tobacco diseases in Canada, by G. H. Berkeley; potato diseases in Dade County, Fla., during the 1936–37 season, by G. D. Ruehle; white rust (*Albugo occidentalis?*) on Texas spinach, by J. S. Wiant; leaf diseases of nursery stock (trees and shrubs) in Illinois in 1936, by J. C. Carter; reports on apple scab for Rhode Island, New York, and Pennsylvania; and seed inspection for disease control, by M. T. Munn.

No. 8.—A survey of the tobacco downy mildew (*Peronospora tabacina*) situation in Florida, Georgia, South Carolina, and North Carolina March 23 to April 20, by P. R. Miller; relative susceptibility of lilac species and varieties to *Microsphaera alni* (including lists of those immune and of those slightly, moderately, and very susceptible), by I. H. Crowell; development of apple scab (spring of 1937) in Rhode Island, New York, and Ohio; fungi growing on decaying banana plants, by O. A. Reinking; and brief notes (including culture of *Sclerotinia trifoliorum* available, anthracnose (*Marssonina panattoniana*) on lettuce in California, powdery mildew (probably *Erysiphe polygoni*) on kale in Virginia, downy mildew (*Basidiophora entospora*) on China aster in Texas, and leaf rust on wheat reported for Texas).

No. 9.—Lists of plants attacked by miscellaneous plant-infesting nematodes (arranged alphabetically by genera and by species of parasite under which the hosts are listed), compiled by L. Crossman and J. R. Christie; the cereal rust situation, by H. B. Humphrey et al.; diseases of bur-clover and alfalfa observed in Georgia, by J. L. Weimer; notes on the incidence of leaf diseases of vegetable crops at the lower Rio Grande substation, Weslaco, Tex., in February, 1937, by G. H. Godfrey; apple diseases in New York; fruit diseases in Rhode Island, by F. L. Howard, and in Virginia, by A. B. Groves; and tobacco downy mildew in Kentucky and Tennessee, by W. D. Valleau.

[Plant disease work by the Illinois Station] (*Illinois Sta. Rpt. 1935, pp. 250, 255, 256, 262–264, 280, 281*).—Notes on the results of investigations are included as follows: Apple disease (measles) more serious than at first thought, studies greatly reduce damage from bacterial spot of peach, and *Phytophthora* root rot studies safeguard State's strawberry crop, all by H. W. Anderson; crossing controls leaf spot diseases of gooseberries, by A. S. Colby; and both bordeaux and copper sulfate dust aids beans, and *Verticillium* wilt of eggplant, both by K. J. Kadow.

[Plant disease work by the Indiana Station] (*Indiana Sta. Rpt. 1936, pp. 27–29, 65, 66, figs. 2*).—Reports of progress are given on the following: *Phytophthora cactorum* trunk canker of apple; tomato virus diseases; commercial fertilizers free from tomato mosaic virus; wheat diseases; corn diseases; and the effect of leaf rust (*Puccinia triticina*) on yield, composition, and quality of wheat (the last three in cooperation with the U. S. D. A. Bureau of Plant Industry).

[Plant pathology studies by the Tennessee Station] (*Tennessee Sta. Rpt. 1936, pp. 48–50*).—Brief statements by C. D. Sherbakoff are included on the progress of work relative to head blight and root rot of wheat; *Fusarium* wilt of cotton and of tomatoes (the latter with J. O. Andes); strawberry black root; tomato leaf spot control (with Andes); and anthracnose-resistant red clover, by J. K. Underwood.

[Plant disease work by the Washington Station] (*Washington Sta. Bul. 342 (1936), pp. 49–53, 68*).—Notes are given on studies of wheat smut, by F. D. Heald, C. S. Holton, and E. F. Gaines (cooperative with the U. S. D. A. Bureau of Plant Industry); bitter pit and related diseases of apple and pear, by Heald, R. Wellman, E. L. Overholser, and F. L. Overley; apple rots, by Heald and Wellman; pear rots, by Heald and H. English; diseases of forage grasses, by G. W. Fischer, Heald, and E. G. Schafer (cooperative with the U. S. D. A. Bureau of Plant Industry); virus diseases of potato and other solanaceous plants, by L. K. Jones and C. L. Vincent; virus diseases of peas, by Jones and F. Johnson; virus diseases of raspberries, by Jones; plant disease survey of the State, by Heald, Jones, and G. A. Huber (cooperative between the Western Washington Station and the U. S. D. A. Bureau of Plant Industry); and cuprocide for control of red leaf spot of cranberries, by D. J. Crowley.

The evaluation of some cuprous oxides recommended as seed-treatment products for the control of damping off, H. W. Anderson, K. J. Kadow, and S. L. Hopperstead (*Phytopathology, 27 (1937), No. 4, pp. 575–587, figs. 4*).—The relative merits as seed treatments for damping-off control of five different makes of cuprous oxide were compared, with the object of learning the necessary specifications of a satisfactory treatment, good commercial control of damping-off of several different vegetable crops being secured with four. The color of cuprous oxide is an unreliable index of treatment value for damping-off control. Attention is directed to the fact that proper seed treatment of peas, in addition to damping-off control, practically prevents the rotting of the cotyledons, which is reflected as increased vine growth and vigor.

Specifications of cuprous oxides to be used as seed-treatment materials for the control of preemergence damping-off are as follows: The product should contain no less than 95 percent cuprous oxide. Treatment should impart a smooth, uniform coverage to treated seed when used at recommended amounts. If the material is fluffy, flows evenly, and fumes or smokes when shaken, it may be considered dustable. The material should pass a 325-mesh screen. Additional fineness does not improve the fungicidal value. Certain detailed precautions are also given.

The relation of light to the diurnal cycle of sporulation of certain downy mildews, C. E. Yarwood (*Jour. Agr. Res. [U. S.], 54 (1937), No. 5, pp. 365–373*).—In this study by the California Experiment Station, emergence of sporangiophores of *Pseudoperonospora humuli* (hop mildew) through the stomata was first observed at 12 p. m., branching was complete and small sporangia had formed at 3 a. m., and sporangia were about full size at 6 a. m. and were mature and readily liberated at 9 a. m. Sporangia were caught in largest numbers on spore-trap slides at 9 a. m. and in decreasing numbers throughout the day. Sporulation of downy mildews of hop, onion (*Peronospora destructor*), grape (*Plasmopara viticola*), and lettuce (*Bremia lactucae*) was inhibited by artificial light at night. Hop and onion mildews sporulated most on infected leaves or plants placed in darkened damp chambers in the late afternoon or evening, and poorly or not at all when thus placed in the early morning. These two mildews failed to sporulate on leaves held in darkness at low humidity and different temperatures for 12 hr. or more, but did so when exposed for 12 hr. to natural or artificial light.

The diurnal cycle of sporulability in hop and onion mildew is believed to depend basically on the alternation of light and darkness in the normal day, but in leaves known to possess high sporulability the actual nocturnal sporulation depends directly on the frequently concomitant darkness and high humidity of night. The diurnal cycle of sporulability of onion mildew was not disturbed

by filling the central cavity of infected leaves with 5 percent sucrose or dextrose solutions or by placing cut leaves with their bases in either of these solutions.

Variability in the fire-blight organism, Erwinia amylovora, P. A. ARK (*Phytopathology, 27 (1937), No. 1, pp. 1–28, figs. 2*).—In this study of 10 isolates representing 6 localities and 8 suscepts, marked variability of *E. amylovora* [=*Bacillus amylovorus*] in virulence was noted and correlated with morphological and some physiological characters. Dissociation was observed and studied. Aging of the culture invariably resulted in the appearance of rough forms, which proved to be stable in ordinary solid and liquid media but which reverted to the smooth type when passed 4–6 times through 2 percent sucrose or 1 percent glucose nutrient broth. The S type was the more virulent. The R type was avirulent for some susceptible shrubs and only slightly virulent to green pear fruits and succulent tips of pear seedlings. The R and intermediate types were obtained from old infections in nature. Ten percent sucrose broth decreased the invasive capacity of the culture but not by increasing the R forms, while 2 percent sucrose restored both attenuated and R forms to the virulent state.

The influence of varying sugar concentrations, such as occur in the nectar of fruit-tree blossoms, and the dissociation of the organism are believed to have an important bearing on the rise and decline of epiphytotics of fire blight.

Distribution and prevalence of Ozonium root rot in the shelter-belt zone of Texas, G. L. PELTIER (*Phytopathology, 27 (1937), No. 2, pp. 145–158, pls. 2, figs. 2*).—In this study by the Nebraska Experiment Station, the *O. omnivorum*-infested areas within the shelterbelt zone extending into southern Oklahoma and Texas in advance of planting were mapped with the object of avoiding these areas or using resistant trees; susceptible plant species being employed as indicators. The universal distribution of three susceptible weeds (horsenettles, ragweeds, and lambsquarters), as well as the presence of conidial mats, aided very materially in detecting *Ozonium*. A section of land was deemed infested when one or more diseased plants revealed the characteristic mycelial weft on the roots or when conidial mats were found. On these bases the approximate limits of root rot infestation were found to be south of 34° N. lat. and east of the 100th meridian. In the main, prevalence of root rot was much more pronounced in the better agricultural lands and in the valleys. Repeated observations indicate that when root rot is found in the headwaters of a stream it usually is distributed throughout the drainage basin, and the incidence of root rot increases at the lower levels. The sharpness with which the infested and noninfested areas were delimited was especially striking.

New Zoopagaceae destructive to soil rhizopods, C. DRECHSLER (*Mycologia, 29 (1937), No. 2, pp. 229–249, figs. 6*).—"Three species of *Cochlonema* and one species of *Zoopage* are newly described herein, increasing the recorded membership of the Zoopagaceae from 22 to 26."

Sexual fusion in Ustilago avenae under natural conditions, J. H. WESTERN (*Phytopathology 27 (1937), No. 4, pp. 547–553, figs. 6*).—Initiation of the dikaryophase and the origin of the cells involved are important for the constancy of parasitic races of *U. avenae*. Although sporidia were produced readily in culture and caused infection when oat seeds were artificially inoculated with the proper combinations, it appears likely that in nature the dikaryophase is more often initiated by the union of adjacent promycelial segments, presumably of opposite sex. Opportunities for hybridization and for changes in pathogenicity are much less than if fusion of sporidia were common, because the nuclei of adjacent segments are derived from a single diploid parent nucleus. Occasionally the promycelium acts as an infection hypha and penetrates the seedling directly.

The present status of seed treatment, with special reference to cereals, R. W. Leukel (*Bot. Rev., 2 (1936), No. 10, pp. 498–527*).—This comprehensive review (with 139 bibliographic references) considers the history of the subject, the advantages of dust treatments, problems in developing and testing seed treatments, diseases of cereals, ornamentals, vegetables, and other crops combatted by seed treatments, fungicidal materials, organic mercurials, centralized seed treatment, and the effects of seed treatment. It is concluded that "the constant aim will be to find or develop disinfectants that are highly toxic to parasitic fungi and bacteria but relatively harmless to the seeds and plants parasitized by them."

Studies concerning the reaction of barley to two undescribed physiologic races of barley mildew, Erysiphe graminis hordei Marchal, J. S. Tidd (*Phytopathology, 27 (1937), No. 1, pp. 51–68, figs. 2*).—The reactions of 85 barley varieties (seedling stage) to the two new physiologic races 6 and 7 were studied. In order to separate races 6 and 1, another variety (Heil Hanna 3 C. I. 682) was added to the list of four differentials used by Mains and Dietz (E. S. R., 68, p. 770). Races 6 and 7 were tested on seedlings during the winter and spring under the differing environal conditions then prevalent in the greenhouse, no marked changes in reaction to either race being shown at these two seasons. In spring adult plants were more resistant than seedlings of the same varieties, while in winter they were fully as susceptible.

Studies of F_2 and F_3 of three crosses between resistant and susceptible plants were also made in the greenhouse, race 6 being used as inoculum. The resistance of the three resistant parents proved in each case to be due to a single main Mendelian factor. (1) In the cross Svansota M786×Hanna C. I. 906, resistance was incompletely dominant. (2) In the cross Featherston C. I. 1118×Goldfoil C. I. 928, resistance was again incompletely dominant. In the F_3 test, conducted in the late spring in the greenhouse, heterozygous individuals have a type 2–3 reaction intermediate between resistance and susceptibility. In the winter, heterozygous F_3 plants were more resistant and gave 1–2 reactions. Independent inheritance of the factor pairs for resistance v. susceptibility and 2-row spikes v. 6-row spikes was indicated. (3) In the cross Arequipa C. I. 1256×Horsford C. I. 610, resistance was dominant. Independent inheritance of the factor pairs for resistance v. susceptibility and hoods v. awns was suggested.

The degree of bunt resistance necessary in a commercial wheat, G. A. Wiebe and F. N. Briggs (*Phytopathology, 27 (1937), No. 3, pp. 313, 314*).—In this cooperative study by the U. S. D. A. Bureau of Plant Industry and the University of California two hybrid wheats slightly susceptible to a physiologic race of *Tilletia tritici* gave 5.6 and 0.8 percent, respectively, of bunted heads under artificial inoculation in 1934, but without additional inoculum and even under conditions favorable for the disease were unable to produce enough inoculum to cause infection in subsequent years. It is concluded that, for practical purposes, slightly susceptible strains of wheat are suitable for commercial production.

A revision of the numbers assigned to physiologic races of the leaf rust of wheat, Puccinia triticina Eriks., H. B. Humphrey, C. O. Johnston, and R. M. Caldwell (*U. S. Dept. Agr., Bur. Plant Indus., 1936, pp. [1]+14*).—To clarify the confused situation, adoption of the revisions here recommended and of the accompanying key and table of reactions is proposed to all investigators interested in the physiologic races of *P. triticina*. Certain features of the revision are briefly discussed. The bibliography includes 13 references.

Influence of stripe rust on growth, water economy, and yield of wheat and barley, W. M. Bever (*Jour. Agr. Res. [U. S.], 54 (1937), No. 5, pp. 375–385,*

figs. 3).—A resistant and a susceptible variety, each of spring wheat and spring barley, were grown to maturity in sealed containers in the greenhouse and infected with *Puccinia glumarum* at various stages of development. Though the two crops were grown in different seasons, the results were strikingly similar. Infection in early stages greatly reduced and retarded plant growth and reduced root production, grain and straw yield, plant height, and size and number of kernels. The effects were much less as inoculation was delayed, but there was material reduction in root and grain weight in susceptible varieties inoculated as late as anthesis. Reduction in grain yield was due to the decreased size and number of kernels and of heads per plant, and to the shriveling of the kernels. The effects were similar though less pronounced on resistant varieties, especially of wheat. The results obtained are stated to have been very similar to those reported by Caldwell et al. (E. S. R., 72, p. 61) and by Johnston and Miller (E. S. R., 73, p. 193), viz, the roots were most severely affected and apparently the most sensitive, and the development of the plant above ground, the grain yield, the kernels, and the water economy were affected in much the same way.

Comparative effectiveness of copper dusts in the control of celery leaf blights in 1936, R. Nelson and R. W. Lewis (*Michigan Sta. Quart. Bul., 19* (*1937*), *No. 3, pp. 159–162, fig. 1*).—This is a report of further progress (E. S. R., 75, p. 214) in testing dust fungicidal treatments (copper oxide, basic copper sulfate, and copper sulfate-lime), from which it is concluded that no evidence is at hand of any superiority of the newer fungicides over the copper sulfate-lime combinations for control of the fungus leaf blights of celery. Bordeaux mixture (8–12–100) as a spray and copper sulfate-lime (20–80) dust are recommended as control measures until future tests prove that other fungicides are more effective or possess other advantages not apparent in the materials tested in 1936.

Black ear rot of corn, C. D. Sherbakoff and L. S. Mayer (*Phytopathology, 27* (*1937*), *No. 2, p. 207, fig. 1*).—This note from the Tennessee Experiment Station records the occurrence of black ear rot of corn caused by *Helminthosporium turcicum* as judged by isolations. It was observed only in a few highly inbred lines (F_7) of the Neal Paymaster variety.

The relation between the chemical nature of the substrate and the degree of chlorosis in corn, C. H. Wadleigh, W. R. Robbins, and J. R. Beckenbach (*Soil Sci., 43* (*1937*), *No. 2, pp. 153–175, pl. 1, figs. 5*).—Tests with five series of plants grown in sand culture supplied with culture solutions by continuous flow are described, the results of which were as follows: With nitrate as sole nitrogen source the severity of chlorosis increased progressively with each increase in pH value of the substrate from pH 3.0 to 7.0, while at pH 8.0 the plants were free. With both nitrate and ammonium sources of nitrogen there was much less chlorosis than with nitrate alone. With the proportion of anions and the pH value of the solution kept approximately constant, plants in the high potassium cultures were slightly chlorotic and those in the high calcium and high magnesium cultures moderately so. With the proportions of cations in the solutions approximately constant, plants in the high phosphate and high nitrate solutions were severely chlorotic, while those in the high sulfate solutions were free.

In general, high titratable acidity corresponded with high phosphate content of the expressed juices. An interrelationship between pH value and phosphorus content of the expressed sap is suggested to explain iron precipitation and the degree of chlorosis. There was a very close direct correlation between the nitrate-nitrogen content of the plants and the chlorotic intensity. It is suggested that iron precipitation and chlorosis are induced in high nitrogen

plants by the relatively higher proportions of metabolically active tissue with relatively high pH as compared with low nitrogen plants. Ammonium nitrogen in the medium was associated with a relatively higher phosphorus content and a relatively lower pH value of the expressed sap than was nitrate nitrogen. Plants grown in solutions containing ammonia were relatively free from chlorosis as compared with those grown in solutions containing nitrate as the sole nitrogen source.

The comparative role of certain nematodes and fungi in the etiology of damping off, or soreshin, of cotton, C. H. Arndt and J. R. Christie (*Phytopathology, 27 (1937), No. 4, pp. 569–572*).—In this cooperative study by the South Carolina Experiment Station and the U. S. D. A. Bureau of Plant Industry, cotton seedlings were grown in soil cultures artificially inoculated with *Fusarium vasinfectum*, *F. moniliforme*, *Glomerella gossypii*, *Aphelenchoides parietinus*, *Aphelenchus avenae*, *Cephalobus elongatus*, and *Acrobeles bütschlii*, each alone; each of the fungi in combination with each of the nematodes; and each of the fungi with all four nematodes. The nematodes did not produce typical sore shin lesions and did not noticeably increase the severity of such lesions when combined with the several fungi, although they increased the stunting of the plants by *F. moniliforme*. Typical damping-off was caused by *G. gossypii*. The fusaria reduced germination and produced lesions on the hypocotyl but did not cause typical damping-off.

An experimental study of some fungi injurious to seedling flax, I. W. Tervet (*Phytopathology, 27 (1937), No. 4, pp. 531–546, figs. 3*).—It is concluded that several soil organisms may be factors in the development of "flax sick" soil and that fungi other than *Fusarium lini* may blight the seedlings or injure the flax roots and thus account for an apparent loss of resistance to wilt. Six isolates of *Helminthosporium* (2 from flax roots, 2 from barley, 1 from wheat, and 1 from rye) proved extremely virulent on Winona flax seedlings in the greenhouse. The pathogenicity of two isolates was high at 80° F. but negligible or low at 70°, while that of the other four was not affected by the temperature range used. Some isolates of *Rhizoctonia solani* from flax, sugar beet, legumes, tomato, eggplant, and barley caused severe damping-off in flax, but isolates from potato usually were not so injurious. One strain of *Pythium*, isolated from wilt-sick soil, also caused damping-off of flax, but five species of *Phytophthora* failed to injure it. Root lesions, root rot, and occasionally stunting of the plant occurred when flax was attacked by *Thielavia basicola*, *Ophiobolus cariceti*, and a few isolates of *Alternaria*.

The type and severity of injury to flax by these fungi varied according to soil type and flora. *Ophiobolus* and *Thielavia* caused greatest injury in steamed soil. *F. lini* was extremely virulent throughout and *Helminthosporium* was also virulent on all soils, but the type of injury varied somewhat.

Studies on "damping off" of cultivated mushrooms and its association with Fusarium species, F. C. Wood (*Phytopathology, 27 (1937), No. 1, pp. 85–94, figs. 2*).—Damping-off, a serious new disease of cultivated mushrooms, was continually associated with *Fusarium* spp. in the casing soil, and by the use of selective media *F. oxysporum*, *F. martii*, *F. culmorum*, *F. flocciferum*, *F. redolens*, *F. sambucinum*, and *F. sambucinum* f. 6 were obtained in pure culture.

F. oxysporum and *F. martii* were the commonest and were studied in detail. Successful inoculations on cultivated mushrooms are described, and symptoms identical with those in commercial beds were obtained.

Certain viroses of the garden pea, Pisum sativum, M. W. Stubbs (*Phytopathology, 27 (1937), No. 3, pp. 242–266, figs. 3*).—Symptomatologically different pea-mosaic viruses and the tobacco ring spot virus were studied in field

and greenhouse. One pea-mosaic virus differed sufficiently from other legume-mosaic viruses to justify designating it as a distinct virus (pea virus 1). Three others differed in symptoms on peas but were alike in all other characteristics studied and are designated as pea virus 2A, 2B, and 2C.

Symptoms of enation pea mosaic (pea virus 1), marble pea mosaic (pea virus 2A), speckle pea mosaic (pea virus 2B), mild pea mosaic (pea virus 2C), and tobacco ring spot virus infection on Alderman pea seedlings are described. The pea-mosaic viruses studied were readily transmitted by *Macrosiphum pisi* and by plant extract when carborundum was used as an abrasive. The 34 varieties of peas inoculated were all more or less susceptible to pea virus 1 and the tobacco ring spot virus. Pea viruses 2A, 2B, and 2C infected all but 6 varieties of peas inoculated. Studies of physical properties of the pea-mosaic viruses showed that pea virus 1 is inactivated by 1 : 3,000 dilution and 4 days' aging in vitro and the 3 strains of pea virus 2 by 1 : 1,500 dilution and 24 hours' aging in vitro. In seed transmission tests involving 13,328 seedlings, only 3 questionable cases of seedling infection from seed were observed. Host range studies showed important differences between pea virus 1 and the 3 strains of pea virus 2. Peas and sweet peas are the only hosts not previously reported for the tobacco ring spot virus.

Viruses other than those here described are believed to cause pea mosaic diseases.

Recent developments in potato breeding for resistance to virus diseases, E. S. SCHULTZ, C. F. CLARK, W. P. RALEIGH, F. J. STEVENSON, R. BONDE, and J. H. BEAUMONT (*Phytopathology, 27 (1937), No. 2, pp. 190–197*).—In this cooperative study between the U. S. D. A. Bureau of Plant Industry and the Maine and Maryland Experiment Stations, data on the inheritance of resistance to mild mosaic and the reaction of seedlings and varieties to other viroses are recorded. Potato varieties and seedlings varied in their reactions to viroses, some being completely resistant, some failing to contract the virus in the field but becoming infected in graft tests, others rarely contracting the virus in the field but becoming infected in grafts, and still others contracting the virus readily by both field exposure and grafts. No definite evidence of resistance to vein-banding mosaic was found. Katahdin was completely resistant to mild mosaic in field-exposure tests, but it is not homozygous for this character. A total of 120 seedlings, selections from different crosses and inbred lines, and 337 lots of South American varieties were exposed to spindle tuber during 1933 and 1934. The results showed some variation in the amount of spread, but it was difficult to determine whether the plants were resistant or only disease-escaping. Most of the 880 seedlings, tuber-grafted with spindle tuber in 1935, became infected. There was great variation in symptoms produced on the different varieties. Field-exposure tests (1933–34) to determine resistance to leaf roll proved unsatisfactory. Transmission by tuber grafts indicated a wide variation in the reaction of different seedlings to this disease. The variations of symptoms of spindle tuber and leaf roll, as expressed in different seedlings, indicate that if varieties cannot be found that will not contract these diseases some may be found that are highly tolerant.

A bacterial wilt and soft rot of the potato in Maine, R. BONDE (*Phytopathology, 27 (1937), No. 1, pp. 106–108, figs. 2*).—In this study from the Maine Experiment Station a bacterial disease is described which apparently is not yet generally distributed in Aroostook County. It has been seen most commonly on Green Mountain, but occurs also on Irish Cobbler and Katahdin potatoes. The organism responsible for the disease has not yet been fully identified.

The relation of rainfall to the development of late blight of Irish potatoes in the coastal section of South Carolina, W. D. Moore (*South Carolina Sta. Circ. 57 (1937), pp. 8*).—This disease is reported to have developed in the coastal section of the State only five times during the past 20 yr. Mean temperature and relative humidity do not appear to affect materially its development, but there is apparently a relation with the amount and distribution of rainfall during the potato growing season.

In general, any regular spraying or dusting program is considered uneconomical, but from rainfall data accumulated during the early part of any growing period it is possible to predict the time and frequency of spray or dust applications advisable for control of the disease. From the rainfall data presented for a 20-yr. period, it would also appear possible to predict seasons when control measures would be desirable.

Breeding of potato varieties resistant to Phytophthora [trans. title], F. F. Sidorov (*Phytopathology, 27 (1937), No. 3, pp. 211–241, fig. 1; Eng. abs. pp. 239, 240*).—By studying a large collection over a 10-yr. period it has been established that all species and varieties of cultivated potatoes are susceptible to *P. infestans*. Nine wild species from Mexico proved resistant, and their utility for selection is said to depend on their taxonomic position. The species most widely used for hybridization is *Solanum demissum*. The hybrids of *S. demissum* × *S. tuberosum* (already in their second generation), especially using backcrosses with *S. tuberosum*, combine resistance with the yields and other characters of domestic varieties. The use of *S. antipoviczii* for selection is also quite possible but more difficult, as its negative influence in crosses with *S. tuberosum* is more marked than in the hybrids of *S. demissum* × *S. tuberosum*.

A study of scab resistance in the potato, H. M. Darling (*Jour. Agr. Res. [U. S.], 54 (1937), No. 4, pp. 305–317, figs. 7*).—In this cooperative study by the Minnesota Experiment Station and the U. S. D. A. Bureau of Plant Industry, the scab resistance of about 300 inbred potato seedlings was tested in the field on scab-infested soil. Wide ranges in susceptibility, but no immune sorts, were found. There was no consistent association of scab resistance with a russet skin. The progeny of certain inbred resistant seedlings were nearly all resistant, indicating their possible value as breeding stock.

The lenticel structures in a resistant and a susceptible seedling were compared. The lenticels of the susceptible seedling were larger and the cells were rounder and more loosely arranged than those of the resistant one. In the resistant seedling the periderm was suberized earlier and extended farther into the lenticels, apparently affording greater protection against infection. The lenticel structure is considered one of the factors in scab resistance.

Sclerotinia rot of Irish potatoes, A. H. Eddins (*Phytopathology, 27 (1937), No. 1, pp. 100–103, figs. 2*).—In this contribution from the Florida Experiment Station, the symptoms of potato infection with *S. sclerotiorum* are described. The inoculations reported indicate that infection may be due either to ascospores or mycelium. New hosts for the fungus are *Calendula officinalis*, *Erechtites hieracifolia*, and *Radicula obtusa*.

Inoculations of potato plants with *S. intermedia* gave negative results, but a rot very similar to that caused by *S. sclerotiorum* was induced by *S. minor*.

Keeping quality of sugar beets as influenced by growth and nutritional factors, F. G. Larmer (*Jour. Agr. Res. [U. S.], 54 (1937), No. 3, pp. 185–198, fig. 1*).—In Utah tests, sugar beets grown under conditions of adequate and inadequate phosphate supply were compared as to keeping quality under commercial storage-pile conditions, samples being stored in coarse-meshed onion sacks. Roots from plats fertilized with superphosphate or complete fertilizer

high in phosphate showed significantly less decay than those from unfertilized plats. Isolations showed *Phoma betae* predominantly associated with rotting in storage. Phosphate fertilization apparently reduced the loss by respiration of sucrose reserves in the roots. In other field tests, phosphate fertilizer and, to some extent, nitrogen applications improved the keeping quality. Barnyard manure, alone or with phosphate or nitrogen, and adequate soil moisture during the growing season influenced the keeping quality favorably, possibly by affecting the phosphate availability. Inoculations with *P. betae* corroborated the field results, sugar beets grown with adequate phosphate showing significantly less decay at 4°–6° and 18°–22° C. than unfertilized controls.

Tobacco diseases in 1936, P. J. Anderson (*Connecticut [New Haven] Sta. Bul. 391 (1937), pp. 108–117, figs. 6*).—Observations and notes on the prevalence of diseases include *Pythium* damping-off in the seedbed, *Rhizoctonia* bed rot, wildfire, a wildfire-resistant strain of tobacco, blackfire, frenching, *Thielavia* root rot, mosaic, physiological brown spot on shade tobacco, weather injuries, and pole rot (due to *Alternaria tenuis* and other fungi).

A progress report is also included of "studies on pole rot—II, vein rot", continuing the investigation previously reported (E. S. R., 76, p. 206). The term "pole rot" applies to what is probably a group of diseases caused by different organisms and exhibiting different symptoms. *A. tenuis* was the fungus most commonly associated the past season, and isolations and inoculation tests indicated its causal relation to the vein rot form of the disease. A study was also made of the penetration of the epidermis and of the mycelium within the tissues of the midrib.

A comparative study of Bacterium tabacum Wolf and Foster and Bacterium angulatum Fromme and Murray, A. C. Braun (*Phytopathology, 27 (1937), No. 3, pp. 283–304, figs. 4*).—In this study by the Wisconsin Experiment Station the progeny of six single-cell strains of *B. angulatum* [=*Phytomonas angulata*] and four of *B. tabacum* [=*P. tabaci*] of known pathogenicity were used. Attempts to secure differential characters of these organisms by morphological, cultural, physiological, and serological methods failed. *B. tabacum* displayed a tendency to lose its ability to secrete a soluble exotoxin when carried in pure culture for prolonged periods. Symptoms produced in tobacco by these nontoxigenic wildfire bacteria were often indistinguishable from those produced by *B. angulatum*, the cause of angular leaf spot of tobacco. The two organisms are recognized as being closely related, but because of distinct differences in pathological behavior it is not considered justifiable to place them in the same species.

Studies on representative strains of tobacco-mosaic virus, J. H. Jensen (*Phytopathology, 27 (1937), No. 1, pp. 69–84, figs. 7*).—Symptoms of 12 tobacco-mosaic virus strains, representative of the range of symptoms produced by 55 strains, are described for tobacco, *Nicotiana sylvestris*, and *N. glutinosa*. One strain, from a slow-moving, necrotic-type strain on tobacco, killed tomato plants. Two strains produced unusually small lesions on leaves of *N. glutinosa*. Single pin-puncture inoculations of some strains to young tobacco plants produced as high as 50 percent infection, other strains were transmitted in less than 1 percent of the trials, and still others ranged between these two extremes. Infectivity trials using the local-lesion method gave similar results. All strains tested withstood 10-min. exposures to 80° C.

Quantitative studies of tobacco-mosaic virus inactivation by ultra-violet light, W. C. Price and J. W. Gowen (*Phytopathology, 27 (1937), No. 3, pp. 267–282, figs. 2*).—The survival values of tobacco-mosaic virus exposed to ultraviolet light are shown to follow a simple exponential curve which is interpreted to mean that absorption of a single unit of energy within a vital portion of a

virus particle is sufficient to cause inactivation of that particle. The rate of inactivation (hence the slope of the survival curve) depends on the amount of energy incident to the virus. When the virus is most purified (as in a solution of crystalline material) and the solution has least extraneous matter to absorb the energy, the rate of inactivation is greatest. Adding juice of healthy tobacco plants to purified virus lowered the rate of inactivation. The rate for crystalline material plus the juice of healthy tobacco plants proved identical with that for virus in the juice of diseased plants. The rate of inactivation of virus in dried material was essentially the same as that for the wet material, except that a portion of the virus failed to become inactivated even after relatively long exposures. This is believed to be due to the fact that some of the virus particles in dried material, because of their fixed position, were overlain by other material and shielded from the ultraviolet light.

Factors relating to the control of ordinary tobacco mosaic, J. JOHNSON (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 4, pp. 239–273, figs. 7*).—Using the local-lesion method to determine concentration, cooperative studies by the Wisconsin Experiment Station and the U. S. D. A. Bureau of Plant Industry were made on the survival and inactivation of tobacco virus 1 in dead tissues of a hybrid tobacco exposed to different environal conditions. Laboratory infection and dissemination tests were also conducted, supported by field records of disease development.

The results indicate that the virus survives in sufficient quantity in harvested tobacco and in field refuse to account for infection from such sources. Some brands of cigars and cigarettes carried fairly high virus concentrations, but other forms of commercial tobacco carried little or none. Virus in field refuse may be largely inactivated when fully exposed to weathering and decay for 5–6 mo. Under field conditions the virus survived at high concentrations in the roots until the succeeding crop was planted. In the absence of freezing and desiccation, some virus may also survive as long as 2 yr. in close association with the soil. Infection from the soil occurs through contact of the stems or leaves. Storms which favor wounding and increase in the area of contact with the soil favor infection in this manner. Although direct infections from the soil may rarely exceed 25 percent, subsequent dissemination from plant to plant by various cultural practices accounts for still higher percentages of mosaic. Field records show that the unusually dry season of 1936, favoring inactivation of the virus in the surface soil by desiccation, resulted in an exceptionally low percentage of infection.

Control of peach leaf curl by autumn applications of various fungicides, E. E. WILSON (*Phytopathology, 27* (*1937*), *No. 1, pp. 110–112*).—Fall applications of bordeaux mixture (2–5–50 and 5–5–50), liquid lime-sulfur (4–50), and Basicop (3–50) gave efficient control, and Coposil (3–50), though not as efficient as the other materials, gave a fair degree of control. A bordeaux application (5–5–50) about 3 weeks before the buds began to swell gave no better control than did the fall application.

Peach mosaic, its identification and control, L. M. HUTCHINS, E. W. BODINE, and H. H. THORNBERRY (*U. S. Dept. Agr. Circ. 427* (*1937*), *pp. 48, figs. 32*).—Continuing the study of this disease (E. S. R., 67, p. 701), now known to occur in Texas, Colorado, California, Utah, New Mexico, and Arizona, it has been found that, although its effects are variable among the horticultural varieties of peaches, its identification may be made by one or more of the following symptoms: Breaking in the flowers, retarded spring foliation, variously mottled and deformed leaves, twig abnormalities, and fruit malformations. The incubation time after graft infection varies with the time of year and the point of introduction. Spring inoculations usually induce symptoms during the same

growing season, while midsummer or fall infections usually do not show signs until the following spring. For the majority of new cases in a given year the symptoms first appear in the spring. Similar symptoms have been observed in *Prunus* species other than the peach.

The virus is not spread from diseased to healthy trees by irrigation water, pruning implements, or by other mechanical contacts. In limited tests it was not carried by viable pollen from a diseased tree, and seedlings from mosaicked seeds grew normally. The disease was not transmitted through the soil. However, under conditions favorable for its spread, it has proved to be one of the most contagious of the peach virus diseases. Though not yet demonstrated, it is believed that the natural vector is an insect.

Cultural methods, fertilizers, sprays, or injection of chemicals have not proved effective for control. However, in an outbreak in Colorado, thorough removal of affected trees in early spring and at frequent intervals throughout the growing season is proving effective in bringing the disease under control.

Comparisons of some old and new materials for spraying cherries (*Michigan Sta. Quart. Bul., 19 (1937), No. 3, pp. 123–142, figs. 9*).—Two papers are included under this heading.

New copper sprays for control of leaf-spot, D. Cation (pp. 123–132).—The comparative value of old and new preparations for cherry leaf spot control was tested under favorable conditions for its development, the copper sprays proving effective. High-calcium bordeaux mixture and red copper oxide gave too much injury for recommendation under Michigan conditions. The other three copper compounds tested gave definitely better control than lime-sulfur when long periods elapsed between applications or when fewer were made. The copper sprays showed eradicative tendencies toward old infections and killed the fungus without inducing leaf drop, while infected leaves sprayed with lime-sulfur turned yellow and dropped. "Cupro K" gave the most effective control over an extended period.

Effect of some copper and sulphur fungicides on the tree and fruit of Montmorency cherry, E. J. Rasmussen (pp. 132–142).—On the basis of tests reported it is recommended that growers who have obtained good control of leaf spot with lime-sulfur should continue to use it. Bordeaux mixture, because of its injurious effects, is not recommended. Some of the newer copper compounds (e. g., Cupro K, "ZO", and Oxobordeaux) are promising and safe enough for trial in a limited way in commercial orchards. Although these new preparations gave control with fewer applications under the experimental conditions, it is advised that they be used only with the same timeliness and thoroughness as are employed with lime-sulfur.

The rosette disease of blackberries and dewberries, A. G. Plakidas (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 4, pp. 275–303, figs. 9*).—The results of a study of the rosette disease and its causal agent are presented by the Louisiana Experiment Station. Rosette proved to be identical to the "double blossom" of blackberries and dewberries described by Cook (E. S. R., 23, p. 453) and others. The causal fungus is *Cercosporella rubi* n. comb (=*Ramularia rubi*), for which a revised description is given. The cardinal temperatures for the fungus in culture were about 6°, 25°, and 30° C. Pathogenicity was established by repeated inoculations, infection being obtained on wild and cultivated species and varieties of blackberries and dewberries. The infection period is shown to be limited, spontaneous infection not usually occurring after the last week of May or the first week of June. Temperature is believed to be the chief factor in limiting the time of infection, the prevailing summer temperatures for Louisiana being higher than the optimum for the fungus.

The fungus occurs in the mycelial stage within the vegetative and flower buds of the host and sporulates only on the open withering blossoms in spring. No intercellular or intracellular invasion of the tissue has ever been observed. The mycelium is closely associated with the embryonic elements of the vegetative and floral buds and probably obtains its nourishment by direct absorption through the thin walls of the young cells. In infected pistils the fungus prevents fusion of the carpellate walls, so that a prominent channel (stylar canal) is left in the carpel wall which is filled with hyphal strands that connect the mycelium in the ovary cavity with that outside. Mycelium also occurs within the ovule. Under certain conditions (described) infection may become systemic in the crowns of dewberry plants arising from tip rootings of rosetted canes. This does not occur in the upright blackberries.

Strawberry root rot in Utah, B. L. Richards and H. H. McKay (*Utah Acad. Sci., Arts, and Letters, Proc., 13 (1935–36), pp. 17–19*).—In this contribution from the Utah Agricultural College the symptoms and injuries caused are described as occurring under Utah conditions. Isolations from over 4,000 roots from diseased plants most frequently yielded *Fusarium orthoceras*, *Rhizoctonia*, *Cylindrocarpon*, *Hainesia*, and *Coniothyrium*. Inoculation tests indicated that *F. orthoceras*, *R. solani*, and *Cylindrocarpon obtusisporum* are capable of inducing typical black rot, and that *Hainesia* may be responsible to some extent. All four are widespread soil fungi. Two obligate parasites in addition to the four pathogenic species named were also found in the cortical layers of the roots, viz, *Olpidium brassicae* and a phycomycetous mycorhizal fungus.

The possibility of Ribes infection by aeciospores of Cronartium ribicola at temperatures above 19° C., R. R. Hirt (*Phytopathology, 27 (1937), No. 1, pp. 104–106*).—Fresh aeciospores from *Pinus strobus* bark were placed on solidified aqueous agar in Petri dishes and held between 12° and 30°. Though previous records had indicated 19° as the maximum, germination occurred up to and including 28°. Taking account of the percentage of germination and the germ tube length at 18 hr., it is considered that the possibility of *Ribes* infection from aeciospores is greater at 12° than between 18° and 28°.

Deficiency chloroses in citrus, A. R. C. Haas (*Soil Sci., 42 (1936), No. 6, pp. 435–443, pls. 3*).—In this study by the California Citrus Experiment Station, using sand, soil, and solution cultures as media for the orange trees, manganese deficiency was accompanied by a chlorotic spotting of the leaves resembling the symptoms frequently seen in the field under conditions of excessive calcium carbonate. The chlorosis resulting from sulfate deficiency required considerable time for the symptoms to develop and consisted of a general yellowing of the leaf with the veins remaining green until the condition became extreme. In magnesium deficiency the chlorosis at first occurred as a yellow stripe on either side of the dark-green midrib, the leaves later assuming a bronze color.

A deficiency of any of these substances in citrus is accompanied by a more or less characteristic chlorosis, and a knowledge of the symptoms corresponding to certain deficiencies is an aid to the field diagnosis of physiological diseases.

Some new aspects of gummosis and psorosis of citrus trees in Florida, A. S. Rhoads (*Fla. State Hort. Soc. Proc., 49 (1936), pp. 36–39, pls. 4*).—Studies by the Florida Experiment Station indicate that once these diseases have progressed beyond a certain point they frequently become systemic. The discovery of extensive invasion of the wood by *Phomopsis citri* and *Diplodia natalensis* explains why trees with advanced gummosis or psorosis usually fail to respond to the bark-scraping method of treatment. Proper treatment of pruning and other wounds with a suitable and durable dressing would not

only obviate the development of many cases of gummosis having their inception through these channels, but would at the same time prevent the entrance of the organisms of decay.

A new species of Candelospora causing decay of citrus fruits, H. S. Fawcett and L. J. Klotz (*Mycologia, 29 (1937), No. 2, pp. 207–215, figs. 6*).—A decay of orange fruit found at Citra, Fla., is shown to be due to *C. citri* n. sp., which is described. Inoculations at the California Citrus Experiment Station indicated the fungus to be capable of causing decay in lemons, oranges, and grapefruit, mature fruit being more susceptible than the immature.

Control of mango blossom-blight and anthracnose, H. E. Stevens (*Fla. State Hort. Soc. Proc., 49 (1936), pp. 125–130*).—Copper-lime dust (20–80), a wettable sulfur, and basic copper sulfate were compared in tests with mangoes on the lower east and west coasts of Florida over three seasons. The dust gave very good control under some conditions, but was difficult to handle in practice except when the air was still. Recommendations resulting from this work advocate applications of bordeaux mixture, properly and timely applied, which to a large extent controls blossom blight and anthracnose. From four to five applications usually give good commercial control. The dormant spray is needed as a clean-up treatment and as a protection to the bloom cluster in its early development. The 4–4–50 formula appeared to be as efficient as stronger mixtures.

Some measurements of detrimental effects of the root-knot nematode on the pineapple plant, G. H. Godfrey and H. R. Hagan (*Phytopathology, 27 (1937), No. 4, pp. 515–530, figs. 2*).—Statistical studies are reported on pineapples grown in the Hawaiian Islands under soil infestation with *Heterodera marioni* over a wide range of intensities. Data taken at 5 mo. of plant growth showed correlations as follows: Root length with gall count as percentage of total roots showing terminal galls —0.69, plant weight with root length 0.76, length of roots with number of roots 0.61, ultimate yield with root length at 5 mo. 0.67, yield with original nematode population as determined by indicator plant readings —0.85. In data taken at 8 mo. of growth in another location the corresponding correlations were lower throughout. Direct gall count in the later reading was completely unreliable as a measure of nematode injury to the plants, with an actual positive correlation of 0.26 between gall count and plant weight. The increased vigor of the heavier plants, derived from escape from early heavy infestation, is indicated as being responsible for a high gall count later, due to increased root surface exposed to infestation in the virtually "nematode-saturated" soil. The same identical population of plants showed a positive correlation of 0.57 between length of roots and plant weight. The root system that developed in spite of nematodes, therefore, is more closely correlated with plant growth in a positive way than is the gall count by any of the criteria tested in a negative way. The multiple correlation of plant weight on the combined factors of root number, root length, and number of galls was 0.72.

Classification of lily-mosaic virus, W. C. Price (*Phytopathology, 27 (1937), No. 4, pp. 561–569, figs. 5*).—Three strains of cucumber-mosaic virus transmitted to *Lilium longiflorum* induced symptoms similar to those of lily mosaic. Virus from diseased lilies, obtained from a commercial grower and transmitted to the Turkish variety of *Nicotiana tabacum*, caused primary necrotic lesions and remained localized, producing only an occasional systemic lesion. On passage from tobacco to tobacco, it gave rise to a strain that became systemic and produced mottling symptoms. The latter was transferred to cucumber and to *Zinnia elegans*, in which it produced mottling symptoms. It is known

from previous work that zinnia leaves mottled by cucumber-mosaic virus strains are immune to infection with virus of cucumber-mosaic strain 6, and that infection of zinnia with viruses unrelated to that of cucumber mosaic does not protect them from infection with cucumber-mosaic strain 6 virus. Inoculations demonstrated that zinnia leaves thoroughly invaded by the passage strain of lily-mosaic virus are immune to infection with virus of cucumber-mosaic strain 6. It is, therefore, concluded that lily-mosaic virus should be classified in the cucumber-mosaic virus group.

Cladosporium leaf blotch of peony, L. J. Meuli (*Phytopathology, 27 (1937), No. 2, pp. 172–182, figs. 3*).—Peony leaf blotch (*C. paeoniae*) has been observed on all aerial portions of broadleaf peonies except the blossoms. It is most common among large commercial plantings and is cumulative. The vigor of infected plants is not noticeably diminished, but the dark-purple foliage discoloration frequently detracts from marketability and ornamental value. The range of the disease is limited, since the conidia are disseminated primarily by moisture and infection occurs in the spring. Infection does not occur on the current year's foliage during the growing season. A full description of peony leaf blotch and its causal organism, together with cultural and pathological studies, are offered to facilitate a clearer understanding of the disease. Of the 10 varieties studied, Oshkosh White, Felix Crousse, and Livingstone proved most susceptible and Gigantea and Humei Carnea most resistant to the disease. Soil and foliage sprays apparently did not reduce infection. Recommended control practices are the destruction of old foliage on which the fungus overwinters and/or transplanting of clean roots to noninfected areas.

Development and succession of forest fungi and diseases in forest plantations, D. V. Baxter (*Mich. Univ., School Forestry and Conserv. Circ. 1 (1937), pp. 44, pls. 9, figs. 3*).—This monograph "reports the results of observations covering a period of several years on the pathology of forest plantations. It lays particular stress (1) on the role played by adverse site factors in predisposing trees to physiological ailments and to attack by fungi, and (2) on the succession of diseases that commonly occurs in plantations as contrasted with natural stands." Studies in the Saginaw and Higgins Lake State Forests, the "Pinetum", and the sand dunes of Michigan included plantation diseases, white pine root rot, diseases of exotic pines, and diseases in fixation plantations.

"In every plantation there is a very definite relation between it as a community and the occurrence of diseases. Ills caused by site alone are apt to be more severe in stands made up of a species which naturally occurs singly than in those composed of gregarious types. A complete system of permanent records, consisting of periodic reports, on representative plantations of different species and mixtures of species on different forest sites and on afterplanting treatments is essential to determine the reasons for successes and failures in plantations."

Relation of oxygen pressure and temperature to growth and carbon-dioxide production in the fungus Polystictus versicolor, T. C. Scheffer and B. E. Livingston (*Amer. Jour. Bot., 24 (1937), No. 3, pp. 109–119, figs. 4*).—"Decay may be expected to be more rapid the more thoroughly the wood is aerated, so long as its water content is adequate to the requirements of the fungus, and the optimal temperature for decay may be expected to be somewhat above the temperature optimum but considerably below the temperature maximum for mycelial growth. It is indicated, for time intervals and wood zones involving a limited range of decay stages, that destruction of wood may be at least rapid in proportion to the spread of infection when relatively low oxygen pressure is accompanied by temperature somewhat lower than the optimum for growth."

ECONOMIC ZOOLOGY—ENTOMOLOGY

Studies of osteology and myology of the beaver (*Castor canadensis*), F. W. Young (*Michigan Sta. Mem. 2 (1937), pp. 84, figs. 48*).—In reporting a study of the bone and muscle structure of the beaver, the osteology is graphically illustrated by plates with accompanying legends. The musculature, which is considered at length (pp. 28–83), gives both detailed descriptions and plate illustrations.

Trapping and transplanting live beavers, L. K. Couch (*U. S. Dept. Agr., Farmers' Bul. 1768 (1937), pp. II+18, figs. 15*).—The damage caused at times by beavers, as in farming communities or in irrigation or diking districts, or their overabundance may make necessary their removal to carefully selected sites where their dam-building activities may aid in the cause of conservation. The present account gives detailed descriptions of live beaver traps, and discusses trapping operations, holding pens, means and methods of transporting and transplanting trapped beavers, and the selection of proper planting sites.

Adventures in bird protection, T. G. Pearson (*New York and London: D. Appleton-Century Co., 1937, pp. XIV+459, [pls. 8]*).—This autobiography, with an introduction by F. M. Chapman, presents information on the history of and personal experiences relating to the advancement of bird protection in America.

Parasites of certain North Carolina Salientia, B. B. Brandt (*Ecol. Monog., 6 (1936), No. 4, pp. 491–532*).—The relations of parasitic infestations to the ages, habitats, and habits of frogs and toads are considered, based upon a study conducted at Beaufort County, N. C., the details being given in 15 tables. "Periodic examinations on 71 bullfrogs, 60 southern leopard frogs, 62 Fowler's toads, 60 spade foots, 55 chorus frogs, and 60 spring peepers were made during the course of a year. Salientians habitually residing in aquatic habitats were more often parasitized with blood protozoans, trematodes, acanthocephalans, and leeches. Seasonal periodicity was observed only in relatively few of the parasites found. Larger, and presumably older, bullfrogs harbored considerably greater numbers of parasites than smaller individuals. Few of the parasites observed occur in a single host. Multiple infestations are common in the salientians studied. As many as 17 species of parasites were found in a single bullfrog. The total number of parasite species distinguished in each of the 6 salientian hosts studied were *Rana catesbeiana* 35, *R. sphenocephala* 30, *Bufo fowleri* 22, *Scaphiopus holbrookii* 15, *Pseudacris brimleyi* 20, and *Hyla crucifer* 21."

A review of the earlier work is presented with a bibliography of five pages.

A comparative assay of black widow anti-sera, F. E. D'Amour (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 2, pp. 262, 263*).—In a comparative assay of the recently perfected superimmune serum from sheep and a sample of convalescent human serum, the former was found to possess a much higher potency, 1 cc neutralizing 25 average lethal doses of the venomous black widow spider. One cc of human convalescent serum showed no neutralizing power whatever against 2 average lethal doses of venom.

A new apparatus for separating insects and other arthropods from the soil, W. R. S. Ladell (*Ann. Appl. Biol., 23 (1936), No. 4, pp. 862–879, pl. 1, figs. 2*).—Following a brief review of the published methods, none of which are considered sufficiently rapid or efficient for soil fumigation investigations, a new method devised at the Rothamsted Experimental Station is described.

"The principle of the method is flotation by a dense liquid (a solution of magnesium sulfate sp. gr. 1.11), aided by stirring of the soil and a stream of fine air bubbles passing from the bottom upward through the mixture of soil

and solution. This produces a froth which contains all the animals, and by raising the level of the liquid in the cylinder the froth is swept over into a tank filled with magnesium sulfate solution; here is deposited any soil that has been carried over. The clear solution is then passed on to a Buchner funnel where the insects and other animals are retained. A black filter paper is used in order to show up Collembola and other colorless organisms."

The advantages claimed for the apparatus include rapidity, cleanliness, efficiency, and nontoxicity.

Culture methods for invertebrate animals, P. S. Galtsoff, F. E. Lutz, P. S. Welch, J. G. Needham, et al. (*Ithaca, N. Y.: Comstock Pub. Co., 1937, pp. XXXII+590, figs. 85*).—This is a compendium prepared cooperatively by American zoologists under the direction of a committee from section F of the American Association for the Advancement of Science and with the assistance of many specialists whose names appear in connection with their respective contributions. References to the literature accompany many of the articles.

Several contributions from experiment stations, all but one of which relate to economic insects, are Rearing of *Scutigerella immaculata*, by G. A. Filinger, Ohio Experiment Station (p. 259) (E. S. R., 59, p. 462); A Method of Rearing Four Species of Plant Bugs [Green Stinkbug, *Euschistus euschistoides*, *E. variolarius*, and *E. tristigmus*] (p. 299) and A Method of Rearing Two Species of Nabidae [*Nabis roseipennis* and *N. rufusculus*] (p. 306), both by F. G. Mundinger, New York State Station; Culture Methods for the Potato Psyllid [*Paratrioza cockerelli*], by G. F. Knowlton, Utah Station (pp. 317–319); Methods Used in Rearing the Mealybug *Pseudococcus comstocki*, by W. S. Hough, Virginia Station (pp. 329, 330); Notes on Breeding the Oriental Fruit Moth (*Grapholitha molesta*), by W. T. Brigham, Connecticut [New Haven] Station (pp. 345–349); A Method for Studying the Hessian Fly and Other Insects [Chinch Bug, Green Bug, and Corn Leaf Aphid], by J. W. McColloch, Kansas Station (pp. 396, 397) (E. S. R., 46, p. 245); Notes on Breeding the Apple Maggot (*Rhagoletis pomonella*), by P. Garman, Connecticut [New Haven] Station (pp. 436, 437); *Mycotretus pulchra*, by H. B. Weiss, New Jersey Stations (p. 460); *Hippodamia 13-punctata*, by C. R. Cutright, Ohio Station (p. 461) (E. S. R., 53, p. 56); Cisidae, by H. B. Weiss, New Jersey Stations (p. 467); and Methods of Producing *Macrocentrus ancylivorus* in Large Numbers for Colonization in Peach Orchards, by P. Garman (pp. 493–495), and Methods of Breeding *Perisierola angulata*, a Cocoon Parasite of the Oriental Fruit Moth, by J. C. Schread (pp. 512, 513), both from the Connecticut [New Haven] Station.

Fragments of entomological history, H. Osborn (*Columbus, Ohio: Author, 1937, pp. VII+394, pls. [48]*).—The information here contributed, which supplements the historical contributions of Howard (E. S. R., 64, p. 648), Essig (E. S. R., 64, p. 648), and Weiss (E. S. R., 75, p. 805), appears in 12 chapters, as follows: Early steps in entomology (pp. 7–12), the nineteenth century (pp. 13–34), Federal service in entomology (pp. 35–50), State entomologists, inspectors, and quarantine officers (pp. 51–66), experiment station entomology (pp. 67–92), entomological instruction in colleges (pp. 93–120), entomological societies (pp. 121–131), entomological publications (pp. 132–139), personal sketches (pp. 140–286), insect collections (pp. 287–307), some regional notes (pp. 308–326), and miscellaneous notes (pp. 327–334).

Concerning official common names for insects, W. E. Britton (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 341–345*).—Information is contributed on the need and requisites for, the applicability of, and needed changes in the common names adopted by the American Association of Economic Entomologists.

On a new type of respiratory interrelation between an insect (chalcid) parasite and its host (Coccidae), W. H. Thorpe (*Parasitology, 28 (1936),*

No. 4, pp. 517–540, figs. 24).—A study of the biology of the hymenopterous parasite *Encyrtus* (*Comys*) *infelix* (Embleton) of the hemispherical scale, the respiratory relationships with which host are of a quite extraordinary character, is reported.

[**Notes on economic insects and their control**] (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 372–381, fig. 1*).—The notes here contributed (E. S. R., 77, p. 65) are as follows: *Thylodrias contractus* Mots. in Texas, by H. J. Reinhard, Texas Experiment Station (p. 372); Methods in Study and Preservation of Leaf-hopper Genitalia, by D. M. Delong and R. H. Davidson (pp. 372–374); Extended Insecticidal Uses of Coal Tar Distillates, by M. H. Doner (p. 374); Dry Pyrocide and Gypsum for Control of the Squash Bug (*Anasa tristis* DeG.), by J. L. Hoerner (p. 375); Some Notes on the Tunneling Habits of *Hylurgopinus rufipes* Eich., by W. B. Becker, Massachusetts Station (p. 375); First Record of *Bathyplectes tristis* (Grav.), a Parasite of the Clover Leaf Weevil in the United States (pp. 375, 376) and *Eumicrosoma benefica* Gahan as an Egg Parasite of the Hairy Chinch Bug [*Blissus hirtus* Montd.] (p. 376), both by F. F. Dicke; Effect of Certain Cold-Storage Treatments on Larvae of Cherry Fruitfly, by S. C. Jones, Oregon Station (pp. 376, 377); Sulfated Higher Alcohol to Control Scale Insects on Greenhouse Plants, by E. I. McDaniel (p. 377); Observations on the Life History of *Paratrioza cockerelli* (Sulc.) in Southern California, by A. C. Davis (pp. 377, 378); *Paratrioza cockerelli* (Sulc.) on Tomatoes in Southwest Texas, by M. J. Janes (p. 379); Some Notes on *Bruchus brachialis* Fahraeus, by L. J. Bottimer (p. 379); Strawberry Leaf Roller [*Ancylis comptana fragariae* Walsh & Riley and *Anacampsis fragariella* Busck] Parasites, by G. A. Knowlton, Utah Station (pp. 379, 380); Breaking the Dormancy in the Sugar-Beet Webworm, *L*[*oxostege*] *sticticalis* L., by Means of Chemicals, by J. H. Pepper, Montana Station (p. 380); Parasites of Larch Sawfly in Western Montana and Great Lakes Region, by P. B. Dowden (p. 381); and Correction—Methyl Bromide Fumigation of Codling Moth Larvae [E. S. R., 76, p. 501], by D. L. Lindgren (p. 381).

[**Report of work in economic zoology and entomology by the Illinois Station**] (*Illinois Sta. Rpt. 1935, pp. 154–182, 260, 261*).—Reference is made to the work of the year (E. S. R., 74, p. 512), by W. P. Flint, W. P. Hayes, G. H. Dungan, J. H. Bigger, F. C. Bauer, M. D. Farrar, J. R. Holbert, L. H. Shropshire, J. J. Jieper, S. C. Chandler, E. R. McGovran, C. C. Compton, W. E. McCauley, W. A. Foster, E. W. Lehmann, A. S. Colby, and R. S. Marsh, with the European corn borer, chinch bug control, resistance of corn hybrids to the corn earworm, a search for an improved fumigant for stored corn, the control of webworms attacking alfalfa and cutworms and armyworms attacking the soybean crop, improved cutworm bait made with lubricating oil, reduction of hessian fly infestation of wheat in 1934, the value of liquid paradichlorobenzene in peach borer control (E. S. R., 76, p. 76), observations of the plum curculio on peach, parasites as a promising means of controlling the oriental fruit moth, introduction of parasites for insect pests, the value of new oil dusts for control of peach insects, the relation of soil-building legumes to the peach insect control problem, the increased effectiveness resulting from the combination of lead arsenate and oil in the place of lead arsenate alone, lack of variation in efficiency of brands of lead arsenate, reduction in injury from San Jose scale resulting from an orchard survey, the value of cryolite in checking damage by the apple flea weevil, oil sprays safe for Illinois orchards, control of the apple borer by paradichlorobenzene in oil, importance of avoiding the use of worthless insecticides, mites as serious enemies of raspberry, thrips as related to the set of strawberries, destruction of the gladiolus thrips on corms in storage, control of leaf rollers and tiers by the use of

pyrethrum, destruction of earthworms in greenhouses by hydrated lime, superiority of steam over hot water in the destruction of nematodes in greenhouses, dusting with sulfur for the control of the broad mite in greenhouses, control of red spiders through dusting with powdered glue, increased abundance of the European elm scale, control of the oystershell scale, control of the privet thrips *Dendrothrips ornatus* Jab. by application of nicotine-penetrol or nicotine-soap spray, crude naphthalene for control of fleas, locust borer control, thallium sulfate as a means of ant control, termite control through treatment of wood with certain combinations of chemicals, protection of clothing in storage by insecticides, value of light and bait traps in insect forecasts, and reduction of mite injury of raspberries by application of oil sprays.

[Work in economic zoology and entomology by the Indiana Station] (*Indiana Sta. Rpt. 1936, pp. 35–40, 47, figs. 8*).—Reference is made (E. S. R., 75, p. 806) to work with the European corn borer, cutworms, corn earworm, chinch bug, tarnished plant bug, cucumber beetles, oriental fruit moth, codling moth (including field insecticide tests, sanitation, spray residue, and light traps), Japanese beetle, hessian fly, white grubs, and winter survival and nesting studies with quail.

[Contributions on economic insects and their control] (*Iowa State Hort. Soc. Rpt., 70 (1935), pp. 10–12, 13–16, 21–24, 45–50, 289–291, 341–350, figs. 16*).—Contributions relating to economic insects, presented at the annual meeting of the Iowa State Horticultural Society and of the affiliated societies in 1935 (E. S. R., 74, p. 366), are Observations on the Apple Maggot in 1935, by C. H. Richardson and T. R. Hansberry (pp. 10–12), and Codling Moth Bait Trap Records, 1935 (pp. 13–16), and Apple Leaf Insects, Including Leaf Hoppers, Red Spiders, and Leaf Miners (pp. 21–24), both by T. R. Hansberry and C. H. Richardson, Iowa Experiment Station; Some Problems in the Control of Small Fruit Pests, by A. S. Colby (pp. 45–50); The Mexican Bean Beetle in Iowa, by C. J. Drake (pp. 289–291), and Results of 1935 [Bee] Disease Resistance Program, by O. W. Park, Iowa Station (pp. 341–350), referred to on page 373.

[Abstracts of entomological theses] (*Iowa State Col. Jour. Sci., 11 (1936), No. 1, pp. 23–25, 48–53, 57–65, 72–74, 121–124*).—Abstracts of doctoral theses here presented include The Firebrat, *Thermobia domestica* (Packard), and Its Gregarine Parasites, by J. A. Adams (pp. 23–25); The Animal Parasites of the Woodchuck (*Marmota monax* L.) With Special Reference to Protozoa, by H. B. Crouch (pp. 48–50); a Toxicological Investigation of Nicotine on the Goldfish and the Cockroach, by L. O. Ellisor (pp. 51–53); On the Penetration of Certain Arsenical Compounds Into the Body of the American Cockroach, *Periplaneta americana* (L.), by L. C. Glover (pp. 57–59); An Investigation of the Penetration of Pyridine, Piperidine, and Nicotine Into the Bodies of Insects, by L. H. Glover (pp. 60–62); Investigation of Codling Moth Populations as They Affect Control Experiments, by T. R. Hansberry (pp. 63–65); The Value of Several Organic ompounds as Contact and Stomach Poisons for Certain Insects, by J. F. Kagy (pp. 72–74); and Studies on Insect Hemolymph With Special Reference to Some Factors Influencing Mitotically Dividing Cells, by O. E. Tauber (pp. 121–124).

[Work in entomology by the Tennessee Station] (*Tennessee Sta. Rpt. 1936, pp. 41–43, 66, 67, figs. 3*).—Reference is made (E. S. R., 76, p. 65) to cryolite as an insecticide for use on tobacco (E. S. R., 76, p. 825), cottonseed meal as a bait for control of the corn earworm, cryolite as a substitute for lead and arsenic, and the more important insect pests of the year (including the variegated cutworm, cabbage aphid, cotton or melon aphid, cotton leaf worm,

and the fall armyworm), all by S. Marcovitch, and codling moth bait trapping, by L. A. Fister and B. D. Drain.

[**Work in economic entomology by the Washington Station**] (*Washington Sta. Bul. 342* (*1936*), *pp. 22, 23, 32, 33, 66, 67*).—The work of the year briefly referred to (E. S. R., 75, p. 79) includes chemical studies of insecticides, by K. Groves; oils in combination with lead arsenate and nonarsenicals and nonlead arsenicals for codling moth control, by R. L. Webster and J. Marshall; the pea moth, by A. J. Hanson and Webster; effect of fatty acids on arsenical sprays, by Marshall; and codling moth activity, by Webster. Work at the Cranberry-Blueberry Substation, by D. S. Crowley, included scale control with insecticides, fireworm control, and fruitworm observations.

Experiments on control of insects of tobacco, 1936, A. W. Morrill, Jr., and D. S. Lacroix (*Connecticut* [*New Haven*] *Sta. Bul. 391* (*1937*), *pp. 84–98, figs. 6*).—Experiments, particularly with the potato flea beetle, conducted cooperatively with the U. S. D. A. Bureau of Entomology and Plant Quarantine, commencing on June 2, 1936, and continuing during the summer, are reported (E. S. R., 76, p. 214), the details being given in eight tables.

In the experimental control work with the potato flea beetle in shade tents, barium fluosilicate, cube root powder (4 percent of rotenone), and sodium aluminum fluosilicate were diluted with sterile tobacco dust. Cube root powder and tobacco dust showed the highest number of dead beetles and the next to the least total leaf injury.

In control experiments with Havana Seed tobacco, comparisons were made of the effectiveness of dust mixtures consisting, respectively, of 1 percent of rotenone, barium fluosilicate diluted with tobacco dust 1 to 3 by volume, cube root powder (1 percent of rotenone) and barium fluosilicate mixed in equal parts with no tobacco dust, and a proprietary mixture containing 0.55 percent of rotenone. There was very little difference in the effectiveness of these materials, which were applied July 18, July 25, and August 3, respectively, following an increase in beetle population that began about July 15, but all showed a distinct improvement over the untreated check. The dust residue on the leaves was not objectionable except on the plat treated with barium fluosilicate and 1 percent of rotenone dust.

Population counts made in observations of the resistance of tobacco indicate that the types known as No. 211 and shade strain D are somewhat resistant to attack by the potato flea beetle.

In a study of the dispersal of the flea beetle, screens covered with adhesive material were erected and captured beetles counted every second day. The beetles seemed definitely to fly from potatoes to the Havana Seed tobacco and to the shade tent, with a marked preference for the latter.

In emergence studies flea beetles were found to appear in the fields in large numbers about the middle of June. The summer brood was very slow in emergence, the peak occurring about July 23 and continuing through the first week in August.

Shade tobacco is said to have been dusted regularly at about 6-day intervals by nearly all growers with a dust containing from 0.67 to 0.83 percent of rotenone, and this apparently prevented any considerable damage by the flea beetles.

Sunflowers planted by one grower as shade in alternate rows with his Havana Seed tobacco as counter-attractants for the beetles, proved definitely attractive. The sunflowers were riddled by the beetles while the tobacco showed little or no damage, and not many beetles were found resting on the tobacco although the sunflower leaves were heavily populated.

The use of power machinery during the summer in the application of poison dusts for flea beetle control resulted in very even distribution of the dust, due to the high velocity of delivery and the swirling motion as the dust leaves the machine. The efficiency of the power duster was proved by the great reduction in flea beetle injury and the coverage of a large acreage in a short time.

Reference is made to the use of several contact insecticides in combating the tobacco thrips, the details of which are tabulated. None of the materials tested, which included lauryl thiocyanate, nicotine sulfate, pyrethrum extract, and cube root powder, proved satisfactory at the strengths used.

Reference is also made to the abundance of the various species of insects on tobacco during the year, including the eastern field wireworm, red-legged grasshopper, lesser migratory locust *Melanoplus mexicanus mexicanus* Sauss., the Carolina grasshopper, dark-sided cutworm, stalk borer, tobacco worm, and tomato worm.

The pests of fruits and hops, A. M. MASSEE (*London: Crosby Lockwood & Son, 1937, pp. 294, pls. [27]*).—The need for an up-to-date work on fruit insects in Great Britain to replace that of Theobald, published in 1909 (E. S. R., 21, p. 655), led to the preparation of this handbook. The insect and other animal pests are considered by host fruits in alphabetical order, followed by chapters on hop pests, beneficial and harmless insects, and insecticides, and on spraying equipment and methods by J. Turnbull. Indexes to scientific and common names and to authors are included.

The animal parasites of domestic and useful animals, and of man, J. FIEBIGER (*Die tierischen Parasiten der Haus- und Nutztiere, sowie des Menschen. Berlin and Wien (Vienna): Urban & Schwarzenberg, 1936, 3. ed., rev., pp. XII+374, pl. 1, figs. 352*).—A revised edition of this work (E. S. R., 49, p. 377). A systematic list of the parasites of domestic and useful, fur-bearing, and laboratory animals, and of man, with their hosts indicated, and a host list of the parasites, with their habitat in or on the hosts, are included.

Household pests: Their habits, prevention, and control, P. B. COLLINS (*London: Isaac Pitman & Sons, 1936, pp. XIII+98, figs. 6*).—A practical account.

Method for determining amount of mineral oil deposited on orange leaves immediately after spraying, V. J. TIHENKO and G. S. HENSILL (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 355–360, fig. 1*).—An account is given of a method for determining the amount of oil deposited on orange leaves. This is considered of particular advantage due to its being rapid, since determinations of oil can be started before the spray has dried. It has been proved that acetone U. S. P. is an efficient solvent for use in this method. Providing careful technic is maintained, no amount of oil of significant importance is lost during any of the various parts of the procedure. It is pointed out that a sulfonation curve for determining the amount of oil in sulfonation bottles must be constructed for the determination of each oil by this method.

The relative quantities of oil deposited upon paraffin-coated plates and upon plant foliage by oil sprays, L. H. DAWSEY, A. W. CRESSMAN, and J. HILEY (*Jour. Agr. Res. [U. S.], 54 (1937), No. 5, pp. 387–398, figs. 3*).—Studies undertaken in an effort, first, to develop a suitable technic capable of giving reproducible plate deposits, and then to determine whether a definite proportionality exists between the quantities of oil retained by the plate surfaces and a selected plant surface, are reported. Included in the report, the details of which appear in tables and graphs, is a description of a method for spraying paraffin-coated mica plates with oil emulsions and determining the quantities of oil deposited by difference in weight.

"Comparison between the quantities of oil deposited on the paraffin surfaces of the plates and those deposited on chrysanthemum foliage, as deter-

mined by chemical analysis, showed that various emulsions give different ratios of plant deposit to plate deposit. It is therefore not practical to attempt to standardize the sprays intended for the plant surface against the plate surface. Within certain limits of error, emulsions containing glue, ammonium caseinate, or bentonite gave characteristic ratios of plant deposit to plate deposit which were independent of the oil concentration or the emulsifier concentration in the dilute sprays, but with soap emulsions these ratios varied *with the concentration of oil and emulsifier*."

The problem of the evaluation of rotenone-containing plants, II, III (*Ann. Appl. Biol., 23 (1936), No. 4, pp. 880–916, figs. 6*).—The second contribution in this series (E. S. R., 74, p. 665) from the Rothamsted Experimental Station, by J. T. Martin and F. Tattersfield, deals with *Derris elliptica*, *D. malaccensis*, and the "Sumatra-type" roots (pp. 880–898); part 3 relates to a study of the optical activities of the resins of these roots by F. Tattersfield and J. T. Martin (pp. 899–916).

Control of wireworms and onion thrips by carbon bisulfide carrying naphthalene or PDB, B. B. Pepper (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 332–336*).—In control work by the New Jersey Experiment Stations with wireworms, which are among the most important pests of cabbage, cauliflower, horseradish, beets, and several other vegetables in the market garden area of the northern counties of the State, "emulsions containing ⅛ oz. of carbon bisulfide and 1 g of either PDB or naphthalene per plant gave an average of better than 80 percent kill of wireworms. Carbon bisulfide alone at the rate of ¼ oz. per plant was ineffective and caused plant injury, while 1 g of PDB in cottonseed oil emulsion gave a 55-percent kill and was apparently safe on plants. Aresklene emulsions of carbon bisulfide appear to be more effective than those made with sulfonated castor oil. The cheapest combination used was carbon bisulfide-crude chipped naphthalene. Carbon bisulfide-naphthalene emulsion was more effective than nicotine sulfate-soap against onion thrips."

Experiences with the termite in New Jersey, T. J. Headlee (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 337–341*).—Notes are contributed from the New Jersey Experiment Stations on the habits under natural conditions and in wooden structures and the means of prevention and control of *Reticulitermes flavipes*, the only species of termite received or taken by the stations.

Periodical cicada control in Michigan for 1936, E. I. McDaniel (*Michigan Sta. Quart. Bul., 19 (1937), No. 3, pp. 144–146, figs. 2*).—The periodical cicada, which made its appearance in 1936, was restricted in its occurrence in Michigan, with few exceptions, to open stands of hickory and oak in the lower two tiers of counties, within which areas an occasional orchard or nursery or block of transplants was attacked. Few, if any, cicadas were found present on land known to have been infested but which had been subjected to intensive cultivation for several years before planting.

Several hundred nymphs sifted from the soil were sprayed in the laboratory with different dilutions of various contact insecticides without killing any of the immature underground forms. In laboratory tests aliphatic thiocyanates applied 1:20 killed the adults, a satisfactory commercial kill being effected with a 1:100 dilution. Three common contact insecticides, (1) thiocyanates plus light petroleum oil or plus spreader, (2) 40-percent nicotine sulfate plus soap, and (3) pyrethrum, were applied in an infested orchard as the first adults appeared, the results being reported in table form. It was found practical to knock the cicadas off the trees with either thiocyanate 1:150 or pyrethrum 1:150 and to follow up with a blowtorch, killing those that survived after a period of from 10 to 12 hr. Where this treatment was not feasible an application of 40-percent nicotine sulfate 1:400 plus soap gave a satisfactory com-

mercial kill. Many eggs were laid in portions of the orchard where no sprays were applied or where the females emerged after the males were killed. Trees previously untreated were sprayed with 0.75 pt. 40-percent nicotine sulfate plus 1.5-percent summer oil to 100 gal. of water, and fewer than 5 percent of the eggs in trees hatched.

Observations on brood X of the periodical cicada in Maryland, E. N. Cory and P. Knight (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 287–294*).—This contribution consists of class reports and observations of staff members of the University of Maryland, made during the fall of 1935 and spring of 1936 and summarized by the authors.

A biological study of Lygaeus kalmii Stål (Hemiptera-Lygaeidae), W. A. Simanton and F. Andre (*Bul. Brooklyn Ent. Soc., 31 (1936), No. 3, pp. 99–107, figs. 7*).—Observations of the biology of this large lygaeid in Iowa, together with a description of its life stages, are presented. Approximately 80 percent of the adults of this insect collected in the field during July and August 1935 were parasitized by a tachinid fly of the genus *Leucostoma*.

Leafhopper control on grapes, R. Hutson (*Michigan Sta. Quart. Bul., 19 (1937), No. 3, pp. 142–144*).—Although eggs at hatching time and the nymphs are killed by nicotine, varied results have attended the use of this insecticide, largely because of the difficulty experienced in accurately timing applications to coincide with the time when all the eggs were laid but before any of the nymphs acquired wings. Some experimental control work during the seasons of 1935 and 1936 with nicotine and other sprays confirmed the view that nicotine does not have much effect upon the adult. That a careful watch be kept for hatching and the sprays applied at that time is emphasized by the results obtained. This method of combating grape leafhoppers was tested during the season of 1936, county agents in the grape-growing areas having been kept informed as to the proper time for spray application. As a result better grape leafhopper control was obtained than for many years. The nicotine sprays applied for such control should contain 1 pt. of 40-percent nicotine per 100 gal. of spray and some spreader.

Reactions of aphids to colored insecticides, J. B. Moore (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 305–309, figs. 2*).—It was found in work at the New York State Experiment Station that the green peach aphid is attracted to potato plants when they are sprayed with bordeaux because of the increased intensity of light reflected from the sprayed surfaces. The insects appear to follow the inverse-square law of light intensities, thus showing that light intensity is the primary factor involved in attracting the aphids to the sprayed surfaces. It was also found that infestations of the cabbage aphid on dusted plats could be reduced below those on untreated plats by dyeing the dusts used. Black dust was the most effective in reducing the infestation. These experiments suggest that present dusting and spraying practices on crops infested with aphids may be profitably modified by the use of dyed materials to produce a reduction in the intensity of light reflected from the treated surfaces.

Growth, reproduction, feeding, and wing development of the mealy plum aphid in relation to climatic factors, L. M. Smith (*Jour. Agr. Res.* [U. S.], *54 (1937), No. 5, pp. 345–364, figs. 9*).—In studies conducted at the California Experiment Station, the details of which are given in tables and graphs, a high correlation was found to exist between the rate of development of the mealy plum aphid and daily mean temperature, and formulas for the determination of the rate of development per day at any mean temperature are presented. The four instars were found to be of approximately equal duration at any given mean temperature. "The correlation between number of young born and daily mean temperature ranged from 0.54 to 0.75 under varying con-

ditions. Rate of reproduction was shown to be related to age of females, which in turn was influenced by temperature. The rate of feeding was related to temperature, and it was found that the rate of feeding did not increase as rapidly as the rate of reproduction for a given increase in temperature. This results in the relative starvation of young born at higher temperatures and is offered as an explanation of wing determination."

A list of 23 references to the literature cited is included.

Do fungi help to exterminate red scale in Palestine? J. CARMIN (*Hadar, 9 (1936), No. 8, pp. 173–175, figs. 7*).—A preliminary account of observations which are considered to show clearly the value of fungi in the extermination of the California red scale in Palestine.

Further tests with pyrethrum as an insecticide for cabbage worms, H. C. HUCKETT (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 323–328*).—Experiments conducted at Riverhead, Long Island, in continuation of earlier work (E. S. R., 75, p. 667), on the effectiveness of pyrethrum dust mixtures when used in the insectary against the young larvae of the zebra caterpillar and for the control of the cabbage looper under field conditions, are reported. The work was conducted with a view to determining what strength of pyrethrum dust mixture might be most effective for commercial purposes and what diluent, if any, might prove to be more satisfactory than others when mixed with the more heavily impregnated pyrethrin powders. "Three types of pyrethrum products were tested, namely, ground pyrethrum flowers of 0.9 and 0.6 percent pyrethrin analysis, an inert material impregnated with the extractives of pyrethrum flowers to carry 2 percent pyrethrin content, and pyrethrum powders impregnated to carry a pyrethrin strength of 0.5 percent. Four inert materials were tried as diluents, namely, clay, talc, gypsum, and infusorial earth. The most notable features of the results in respect to the factors of pyrethrin strength in the finished dust and type of diluent were the greater effectiveness of dusts having a stock pyrethrum powder of lower pyrethrin analysis as compared with a higher analysis, and the diminished effectiveness of dusts having clay as the diluent in comparison with those containing talc, gypsum, or infusorial earth."

A recent pest of alfalfa, L. O. ELLISOR and L. T. GRAHAM (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 278–280*).—This contribution from the Louisiana Experiment Station relates to the velvet bean caterpillar, which was a serious pest of alfalfa in southern Louisiana during the late summer and fall of 1936. The egg parasite *Trichogramma minutum* and a parasitic fungus, *Spicaria prasina*, were factors in reducing the infestation in some areas. At present, its combat is limited to poison control on fall seedlings and to the delay of fall plantings to prevent defoliation of the seedlings by the caterpillars.

Earlier accounts of this caterpillar as a pest of soybeans in Louisiana by Hinds and in Louisiana and Texas by Douglas (E. S. R., 64, p. 54) have been noted.

Biology and control of the juniper webworm in Maryland, G. S. LANGFORD (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 320–323*).—An account is given of the biology and seasonal history, natural enemies, and control of *Dichomeris marginellus* Fab. This webworm, which appeared as an injurious insect in Maryland in 1931, has since spread quite generally over the State, and is now the most injurious insect in the State attacking juniper, including *Juniperus communis* and the varieties *depressa, depressa aurea, hibernica,* and *suecica.* Other species of juniper, even when adjacent to *J. communis,* have not been observed to be attacked. The webworm, of which there is but one brood a year, passes the winter as partly grown larvae in silken cases within the webbed foliage. Some larvae, depending on the season, may pupate as early as April 25, others as late as June 27. The greatest number of pupae are

usually found in the field between May 22 and June 1. The pupal period varied from 10 to 20 days, with an average of about 16 days. Adults have been observed to emerge as early as May 19 and as late as July 7. The peak of emergence normally takes place between June 1 and June 10. It is attacked by the straw itch mite and several hymenopterous parasites, including *Horismenus microgaster* Ashm., which was frequently found emerging from larvae. The parasites *Dibrachys cavus* Walk., *Ephialtes aequalis* (Prov.), *Itoplectis conquisitor* (Say), and *Habrocytus* sp. were reared from the pupae.

Control tests have indicated that arsenate of lead applied as a spray without a spreader is an efficient remedy. "In a series of tests spraying with arsenate of lead, 2 lb. in 50 gal. of water, at approximately monthly intervals from July 1 to October 1 and from March 1 to May 1 gave an average kill of 97.2 percent. Sprays applied between May 1 and May 20 were not as effective, because too many larvae had finished feeding and were in the process of transformation. However, arsenate of lead applied during that period, or even much earlier in the spring, is quite effective in preventing injury by the new generation. Because of its residue, arsenate of lead proved to be superior to pyrethrum and rotenone sprays. . . .

"When used at dilutions sufficiently strong and care was taken to wet all larvae with the solution, pyrethrum soap sprays applied between July 1 and October 1 and between March 1 and May 1 appeared to give as good a kill as arsenate of lead. The material used contained about 2 percent pyrethrins and gave an average kill of 97.3 percent at a dilution of 1:200 and 96.4 percent at a dilution of 1:400."

A dust of either undiluted arsenate of lead or calcium arsenate was found to be effective "if applied during summer or early fall. Diluted arsenate of lead was not promising. One test made early in April, using arsenate of lead, diluted 1 part in 6 parts of 300-mesh sulfur, was not effective. After 21 days only 68.4 percent of the larvae were dead. Two tests, one in the spring and another during late summer, made with a 60-percent pyrethrum dust, gave 79.6 percent kill for the spring application and 94.4 percent for the summer application.

"Results obtained with rotenone dusts have been variable. The best kill, 73.3 percent, was obtained with a 0.75-percent rotenone dust applied during late summer."

Notes on a cacao pod borer moth, Acrocercops cramerella Snell, F. Q. Otanes (*Philippine Jour. Agr., 7 (1936), No. 4, pp. 419–423, pls. 2*).—Notes are given on *A. cramerella*, a lepidopterous enemy of cacao in Java, which was observed by the author first in the field at Mulig, Davao, P. I., in May 1932 and again in May and June 1936, and which has appeared at other points. It has been found in Davao somewhat widespread, as high as 90 percent of the pods in the cacao-growing districts being usually destroyed.

The toxicity of combinations of nicotine, under Michigan conditions, to the tree and to the codling moth (Carpocapsa pomonella Linn.), J. M. Merritt (*Michigan Sta. Tech. Bul. 154 (1937), pp. 47, figs. 9*).—Following a brief introduction, a review of the literature with a list of 34 references, and a discussion of the experimental theory and objectives, experiments conducted in 1934 and 1935 are reported. The findings, the details of which are given in 23 tables, led to the conclusion that the use of nicotine in cover sprays as the active principle is entirely satisfactory for codling moth control provided the interval between sprays does not exceed the period of toxicity of each application. It supplies a substitute insecticide for inclusion in the spraying program of growers who find it impractical to attempt removal of arsenical or lead

residues. No environmental effects were encountered in either of the 2 yr. which prevented some degree of control with any material tested. It is pointed out that the data are too limited to make this a definite characteristic, for some materials have been found ineffective elsewhere under conditions which might be expected to occur in Michigan.

"It has been shown that it is possible to modify the nicotine volatilization by certain combinations, and that the deposition of nicotine by each spray is proportional to the control of codling moth, except when materials used in modification are in themselves insecticides.

"A definite effect of sprays applied to the foliage and fruit has been demonstrated, the toxicity resulting either from some components of the combinations applied, as in the case of sulfur, or oil in the oil-nicotine combination, or from the resultant combination as in the case of Nico-Zin-oil, or by the position in the schedule of different materials, as in the case of oil following sulfur applications. The complete elimination of injury is also possible as in the case of the bentonite-nicotine combinations used in 1935.

"These experiments indicate that no more practical nicotine combination than summer oil and nicotine sulfate was tested. Control of both types of codling moth injury and production of satisfactory quality fruit was best achieved by this material. However, other materials will give either better codling moth control, or less injury, or better quality fruit, or higher photosynthetic activity, with resultant increase in quality, or longer retention of toxicity."

Experiments with calcium arsenate to control codling moth, B. F. Driggers (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 314–319*).—In work at the new Jersey Experiment Stations calcium arsenate "was compared pound for pound with lead arsenate in a schedule with summer oil used three times on first brood and once on second brood in a Glassboro orchard heavily infested with codling moth. Approximately twice as many larvae succeeded in entering the apples on the plat sprayed with calcium arsenate as on the plat sprayed with lead arsenate, even though the arsenic deposit on the two plats was approximately equal. The inferiority of the calcium arsenate was further brought out by the fact that a plat sprayed with lead arsenate-oil for first brood, but which received no second-brood sprays, had no more worm entries than the calcium arsenate plat which received the same number of first-brood sprays plus second-brood sprays.

"At Moorestown calcium arsenate was compared to lead arsenate in the lime-milk schedule. Approximately eight times as many larvae gained entrance to the fruit sprayed with calcium arsenate-lime-milk as gained entrance to the fruit sprayed with lead arsenate-lime-milk. A plat sprayed with lead arsenate-lime-milk first brood only and a plat sprayed with lead arsenate-oil first brood only had fewer worm entries than the calcium arsenate-lime-milk plat sprayed for both the first and second broods.

"It is suggested that the superiority of lead arsenate over calcium arsenate as a spray for codling moth may be due to the superior physical properties of the lead arsenate over the calcium arsenate."

Experimental break of the diapause of the codling moth [trans. title], A. Balachowsky (*Compt. Rend. Acad. Sci.* [*Paris*], *204* (*1937*), *No. 4, pp. 294, 295*).—The author finds that a break in the diapause of the codling moth, upon completion of their growth (fifth larval instar), is obtained through exposure of the larvae to a low temperature followed immediately by transfer and maintenance at a high temperature, the resulting break being caused by the sudden thermal shock.

Egg and larval populations of European corn borer in relation to time of planting and yields of sweet corn, M. SCHLOSBERG and R. MATHES (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 280–287*).—In studies made in 1934, 1935, and 1936 in northern Ohio satisfactory protection from European corn borer infestation and favorable corn yields were obtained under single-generation conditions in plantings made from the first week in June to the first week in July. "In 1936 a partial second generation of moths reduced the protection otherwise gained by late planting. Late-planted corn was more severely infested by the corn earworm (*Heliothis obsoleta* Fab.), but consequent injury of the ears was not reflected in the yield of cut corn for canning. In an evaluation of the economy of late planting to reduce borer infestation the market gardener must consider the relatively higher prices prevailing early in the season, while the canner is concerned with factory operation, labor costs in handling the ears, and danger of contamination of the canned product."

Resistance of a single-cross hybrid strain of field corn to European corn borer, L. H. PATCH (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 271–278, fig. 1*).—A study of the comparative borer resistance of two single-cross hybrid strains of corn of about equal seasonal requirements that were infested naturally by the European corn borer in 1936 is reported. One of the strains, Ill. R4 × Ill. Hy, had shown a relatively high degree of borer resistance during several seasons when infestations were induced by placing eggs on the plants by hand, whereas the other strain, Ill. A × Ind. Tr, had proved to be borer susceptible when tested by similar methods. The borer-resistant strain has also given promise as a high-yielding strain, the 14 plantings made of it from 1931 to 1935, inclusive, yielding an average of 9 bu. per acre more than the mean yield of all the strains in the tests.

The number of borers reaching maturity in 10 plantings of R4 × Hy made in 1936 was equal to 46.6 percent of the number in A × Tr. The numbers of egg masses laid on the strains were about the same. It is considered improbable that the small differences noted between the strains in leaf area and stage of plant development accounted for the large differences in final borer populations. Past experiments indicate that the borer resistance of single-cross strain, R4 × Hy, compared with local open-pollinated varieties Clarage and Woodburn would be about the same as when the comparison is with single-cross strain, A × Tr.

Experiments on the resistance of the flour moth (Ephestia kühniella Zell.) to abnormally high temperatures, G. H. MANSBRIDGE (*Ann. Appl. Biol., 23 (1936), No. 4, pp. 803–821, figs. 4*).—The resistance of the Mediterranean flour moth to high temperatures is reported upon. When exposed to 113° and 116° F., 1-day-old eggs are more resistant than older eggs. "Eggs are more resistant to heat at low than at high humidities. Eggs appear to be able to cool themselves at low humidities in a high temperature by the evaporation of water. After heating, eggs can regain water they have lost if they are kept in a moist atmosphere. After heating at low humidities, there is a bigger survival if the eggs are kept in a moist atmosphere than if they are kept in a dry atmosphere. There is a great variation in stock from a mill. Eggs from different pairs of moths may have widely different degrees of resistance. Stock which has been inbred in the insectaries for 12 generations shows less variation in resistance than stock direct from a mill. Larvae are much less resistant than eggs. Newly hatched larvae and all larvae until they are full grown have about the same resistance. Last-stage larvae are far more resistant than other larvae. Pupae are more resistant than feeding larvae. Adults are the most susceptible stage to heat. At low humidities the females are more resistant than the males.

"Experiments on all stages in undisturbed cultures show that a temperature of 45° to 46° C., maintained for 3 hr., kills all stages."

Reaction of corn ear worm moth and other insects to light traps, L. A. CARRUTH and T. W. KERR, JR. (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 297–305, figs. 3*).—Three types of light sources in electrocuting traps were tested by the New York State Experiment Station against female moths of the corn earworm in cornfields on western Long Island during 1936 in attempts to reduce larval infestations in sweet corn. "The numbers of moths caught were directly influenced by mean night temperatures. A seasonal variation in numbers of moths caught was observed which corresponded with expected periods of moth abundance. Two types of mercury vapor light sources each attracted more corn earworm moths than did a 75-w tungsten light source, although fewer females were caught than males. It may be questioned whether any of the traps used were fully effective in attracting female moths of the corn earworm. No appreciable reduction in larval infestations resulted from any of the traps used. Incidental observations are reported on the reaction of Asiatic garden beetles and moths of the European corn borer to the light traps."

Some facts underlying the attraction of mosquitoes to sources of radiant energy, T. J. HEADLEE (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 309–312*).—The results obtained by the New Jersey Experiment Stations in an investigation of the relationship existing between certain sources of radiant energy known to be attractive to mosquitoes and the number of mosquitoes caught under the same set of environmental conditions are reported.

Four of the New Jersey mosquito traps were set up, the sources of radiant energy employed being as follows: Trap 1, a 25-w white-frosted bulb, giving a white light, under the hood; trap 2, a tube filled with neon gas, giving a red light; trap 3, a tube filled with mercury vapor and so stained as to give a green-yellow light; trap 4, a tube filled with mercury argon vapor and unstained, giving a blue light. The vapor-filled tubes when subjected to high voltage blazed with light running through red, green-yellow, and blue. The tabulated results show that the "attraction power of the red light as measured in number of mosquitoes caught per microwatt is 6.1 times the number that would have been taken per microwatt in white light in trap 2, that the number of mosquitoes taken per microwatt in green-yellow is 12.3 times as many as would have been taken per microwatt with white light in trap 3, and that the number of mosquitoes taken per microwatt in blue light is 21.5 times as great as would have been taken per microwatt in white light in trap 4."

Earlier work (E. S. R., 68, p. 789) has convinced the author that the 25-w white-frosted bulb does not produce an intensity even approaching that point on the curve of reaction where attraction turns to repellency.

Studies in reducing volume of oil necessary to kill mosquito larvae by incorporating pyrethrum, J. M. GINSBURG (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 328–332*).—In research at the New Jersey Experiment Stations, experiments were conducted in the laboratory with kerosene containing different percentages of pyrethrins on two species of mosquito larvae (the salt-marsh mosquito and *Culex pipiens*) "with the purpose of ascertaining the smallest quantity of pyrethrins which will increase the toxicity of kerosene to the extent that the minimum volume of oil by which it is physically possible uniformly to cover a given area of water should at the same time also produce a toxic film to mosquito larvae. The results suggest that the toxicity of kerosene to mosquito larvae can be increased four times by incorporating 0.01 to 0.04 percent actual pyrethrins, thereby reducing the volume of oil required to cover an acre of water surface under laboratory conditions from 12 to 3 gal."

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Toxicity of phenothiazine derivatives to culicine mosquito larvae, P. S. Schaffer, H. L. Haller, and D. E. Fink (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 361–363, fig. 1*).—In the work reported 11 derivatives of phenothiazine were tested against culicine mosquito larvae to determine the effect of substituents in a molecule known to possess high toxicity; 6-methylphenothiazine was one-half as toxic as phenothiazine, and all the other derivatives were even less toxic.

Sheep blow-fly investigations, III, IV, R. P. Hobson (*Ann. Appl. Biol., 23 (1936), No. 4, pp. 845–861*).—Two further contributions (E. S. R., 74, p. 670) are presented:

III. *Observations on the chemotropism of Lucilia sericata Mg.* (pp. 845–851).—The attraction for *L. sericata* of putrefying substances seems to be due largely to the presence of indole, skatole, and ammonium carbonate. When dilute solutions of these compounds are placed in the fleece of live sheep, *L. sericata* females are attracted to oviposit. A technic for testing repellents based on this tropism has been devised.

IV. *On the chemistry of the fleece with reference to the susceptibility of sheep to blow-fly attack* (pp. 852–861).—This is a study of the distribution of the water-soluble matter in wool, referred to as suint and usually regarded as the dry residue from the evaporation of the product of the sudoriferous glands.

Convenient method of rearing the stable fly, A. E. Doty (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 367–369*).—A description is given of a method for rearing large numbers of the stablefly. It is pointed out that this fly has a very low resistance to sprays containing pyrethrum, rotenone, or thiocyanates and is not as suitable for laboratory repellency tests as is the housefly.

Weight of adult housefly and effect of a sublethal dose of sodium arsenite upon it, J. C. Gaines, S. Clare, and C. H. Richardson (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 363–366, fig. 1*).—In work conducted at the Iowa Experiment Station the mean weight of 402 male houseflies was found to be 18.075 mg and of 457 females 27.65 mg. "The distributions of these weights closely approached the normal. The weights of the females were more variable than those of the males, probably reflecting the somewhat unequal development of the eggs in the individuals of the female population. Flies which were allowed to feed ad libitum for 18 hr. upon sublethal concentrations of sodium arsenite in sucrose solution and then were fed milk for about 6 days did not differ significantly in weight from normally fed flies. The poisoned flies were distinctly more sluggish 6 days after feeding upon the arsenical solution than the control flies."

Testing fly sprays: Modified procedure in testing petroleum base insecticides by the settling mist method, A. E. Zermuehlen and T. C. Allen (*Soap, 12 (1936), No. 6, pp. 105–107, figs. 2*).—An account is given in this contribution from the Wisconsin Experiment Station of a modified laboratory method developed which employs a screen wire testing cage for subjecting houseflies to a vaporized kerosene-base insecticide.

Acemyia calloti, a dipterous endoparasite of grasshoppers [trans. title], E. Séguy (*Ann. Parasitol. Humaine et Compar., 14 (1936), No. 4, pp. 321–326, figs. 2*).—A dipterous parasite of *Acridium aegyptium* L. in Tunis is described as new under the name *A. calloti*.

A note on the attack of Acridium aegyptium by dipterous parasites of the genus Acemyia and on a fungus hyperparasite [trans. title], J. Callot (*Ann. Parasitol. Humaine et Compar., 14 (1936), No. 4, pp. 327–329*).—The author records the parasitism of *A. aegyptium* by *Acemyia acuticornis* Meig. and *A. calloti* Séguy in the environs of Tunis. Notes on the life history of these parasites and a reference to the attack of *Acemyia* sp. by the fungus parasite *Beauveria globulifera* are included.

The Valencia orange and the Mediterranean fruit fly, S. Yedidyah (*Hadar, 9 (1936), No. 8, pp. 167, 168, 170, 171, figs. 2*).—Tests of Clensel bait of 5 percent strength, suspended in traps on trees during the seasons of 1934, 1935, and 1936, the details of which are given in tables, have shown that compared with other baits that draw various insects Clensel is especially suited to attract the Mediterranean fruitfly, the great majority of the trapped flies being females. It failed, however, to protect the Valencia crop during the three experimental seasons and also failed to protect deciduous fruits (apricots, peaches, plums, etc.) in the orchards of Miqveh-Israel.

Control of Rhagoletis pomonella (Walsh) in cultivated blueberry fields, C. S. Beckwith and C. A. Doehlert (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 294–297*).—Contributing from the New Jersey Experiment Stations, the authors report studies which have shown that adults of the blueberry maggot can be killed in cultivated blueberry plantations by dusting from an airplane or autogiro with from 10 to 15 lb. of derris dust (5 percent rotenone) to the acre. The time for the treatments in New Jersey is approximately June 27–30 and July 7–10.

Studies on Oscinella frit Linn.: Inheritance of resistance of oats to attack by the fly and the combination of resistance with other characters of agricultural importance, N. Cunliffe (*Ann. Appl. Biol., 23 (1936), No. 4, pp. 822–844, fig. 1*).—The technic adopted in an attempt to hybridize oats by the use of a resistant variety as one parent is first described.

The experimental data reported have shown that resistance to attack by the frit fly is an inheritable character (or complex of characters), although difficult of precise measurement. Agricultural quality and resistance to attack are not incompatible. Wet weather conditions during the flight of the fly have a very marked effect in limiting the extent of damage to the crop. Varietal differences in extent of attack may be due to varietal differences in crude fiber production or deposition of silica, both tending to increase the larval difficulties and therefore the resistance of the plant.

Control of the potato flea-beetle (Epitrix cucumeris Harris), L. D. Anderson and H. G. Walker (*Virginia Truck Sta. Bul. 92 (1936), pp. 1359–1378, figs. 3*).—The importance of the potato flea beetle as an enemy of potatoes in the northern part of Accomac County on the Eastern Shore of Virginia, where, by feeding upon the leaves, it has caused a serious reduction in yield, led to studies of its control on several farms near New Church.

Insecticide combinations with bordeaux and other sprays and dusts were tested on small plats with hand equipment, 37 in 1932, 29 in 1933, and 19 in 1934, and included the several arsenicals, fluorine, nicotine, pyrethrum, and derris products. The details of experimental work conducted in 1935 and 1936 on large plats with engine and traction power equipment are reported in tables.

A calcium arsenate-bordeaux mixture (2–4–6–50), applied at 7- to 10-day intervals throughout the growing season at the rate of 100 gal. per acre for each application, was found to give the best results and is recommended for flea beetle control. It is pointed out that particular precautions should be taken to time the applications so that the plants are kept thoroughly coated with this material while the new brood of beetles is appearing. In eastern Virginia, this is usually between June 15 and 25.

Although application of the calcium arsenate-bordeaux spray increases the yield nearly twice as much as dusting with a calcium arsenate-monohydrated copper sulfate-hydrated lime (25–20–55) mixture, this dust will give profitable returns, and its use is recommended when spraying is impracticable.

The contribution is accompanied by a list of 29 references to the literature.

On Chinese citrus flea-beetle and allied species, S. H. Chen (*Sinensia, 7 (1936), No. 3, pp. 371–398, figs. 30*).—Of the 14 species of flea beetles here noted, 4 are said to be injurious to citrus in China, namely, *Clitea metallica* Chen, *Podagricomela weisei* Heiktgr., *P. nigricollis* Chen, and *Throscoryssa citri* Maulik.

A note on the biology of Chilocorus bipustulatus and its status in Palestine, O. Hecht (*Hadar, 9 (1936), No. 8, p. 171*).—This is a brief preliminary note on a ladybeetle that occurs as a predator of the California red scale in the citrus groves of Palestine, observations of which were made with a view to determining why it has so little influence in checking the increase of this pest.

The ecology of Passalus cornutus Fabricius, a beetle which lives in rotting logs, A. S. Pearse, M. T. Patterson, J. S. Rankin, and G. W. Wharton (*Ecol. Monog., 6 (1936), No. 4, pp. 455–490, figs. 43*).—Following the brief introduction, this contribution on the horned passalus deals with its seasonal cycles, foods, and parasites and commensals, for which a new genus is erected and several species are described as new, the details being given in 8 tables. The account is accompanied by a list of 37 references to the literature.

Practical field methods of sampling soil for wireworms, E. W. Jones (*Jour. Agr. Res.* [*U. S.*], *54 (1937), No. 2, pp. 123–134, figs. 7*).—A report is made of a search for a time- and labor-saving system of random sampling that will give fairly accurate estimates of wireworm populations in the soil. The methods that have been selected consist in taking small sampling units of soil at random over the field. The field equipment consists of a metal sampling form, a soil-sifting machine or a soil-washing outfit, a tamper, a square-edged shovel, 10-qt. pails, and record blanks.

The data obtained with sampling units of three sizes—1, ¼, and 1/16 sq. ft.—have been subjected to a statistical analysis. The wireworm distribution is moderately asymmetrical for the 1-square foot unit, the class frequency decreasing with markedly greater rapidity on one side of the maximum than on the other. The distributions show close agreement with the Poisson series. The 1-square-foot units give more precision in estimating the mean than either of the smaller units. In determining the smallest number of sampling units that may be taken, comparisons were made on the basis of four different population densities for each of the three units. Little practical reduction of the sampling error is obtained at any population by using more than 50 samples to determine the average number of wireworms per square foot of soil. At low population levels it is necessary to take at least 50 samples. At the intermediate and high levels of population a smaller number of samples is sufficient.

Nomenclature of Listroderes obliquus Klug (the vegetable weevil) (Coleoptera: Curculionidae), L. L. Buchanan (*Ent. Soc. Wash. Proc., 38 (1936), No. 9, pp. 204–208*).—A chronology is given which lists references to the more important papers bearing on the nomenclature of *L. obliquus* and *L. costirostris* Schoen. *L. obliquus* appears to be the correct name.

Influence of size of brood cell upon size and variability of the honeybee, R. A. Grout (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 345–354, figs. 2*).—Work at the Iowa Experiment Station is reported, the details being given in tables and graphs. The size of brood cell was found to affect the size of the adult worker bee, and significantly larger bees were obtained through the use of enlarged cell foundation. The size of brood cell was not sufficient to produce a much larger worker bee and apparently does not affect the variability of the adult worker bee. It was found that the length and the width of the right forewing tend to give the best estimation of the length of proboscis.

Disease resistance and American foulbrood.—Results of 2nd season of cooperative experiment, O. W. PARK, F. C. PELLETT, and F. B. PADDOCK (*Amer. Bee Jour., 77 (1937), No. 1, pp. 20–25, 34, figs. 18*).—The results of a second season of cooperative experiment by the Iowa Experiment Station (E. S. R., 75, p. 818) led to the conclusion that resistance to American foulbrood does exist in honeybees, and that the factor for resistance can be transmitted to offspring.

Disease resistance in honeybees, O. W. PARK (*Gleanings Bee Cult., 65 (1937), Nos. 2, pp. 82–84, 117, figs. 4; 3, pp. 148–150, 176, figs. 12; 4, pp. 232, 233, figs. 6*).—A practical contribution from the Iowa Experiment Station, presented at the international conference at San Antonio, Tex., in November 1936, based upon work on the resistance to American foulbrood.

"The major findings for the two seasons may be summed up as follows: (1) Nearly half of the presumbaly resistant colonies tested have rid themselves of all symptoms of American foulbrood; (2) one-third of the second generation colonies tested have, likewise, eliminated all symptoms of this disease. It is concluded, therefore, that resistance to American foulbrood does exist in honeybees, that it is inheritable, and that the eventual development of a strain of honeybees highly resistant to this disease appears to be well within the realm of possibility."

Control of the pavement ant attacking eggplants, H. G. WALKER and L. D. ANDERSON (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 312–314*).—Report is made by the Virginia Truck Experiment Station of control work with the pavement ant, which has seriously injured many fields of eggplants in the Norfolk area during the last few years. In the spring of 1936 from 5 to more than 50 percent of the plants were found attacked. Many materials, including poison bran bait, a paris green-brown sugar bait, carbon disulfide emulsion, corrosive sublimate, derris, Creolol, Cyanogas, an ethylene dichloride-carbon tetrachloride mixture, 3 percent nicotine dust, and fish scrap, gave unsatisfactory results. Halowax, Loro, and naphthalene flakes gave promising results. Naphthalene flakes gave the most lasting protection but appeared to have a retarding effect upon the growth of the plants where it was applied in close contact with the roots.

On the oviposition habits of Stilbula cynipiformis Rossi (Hymen., Eucharidae), H. L. PARKER (*Ent. Soc. Wash. Proc., 39 (1937), No. 1, pp. 1–3, fig. 1*).—Observations of *S. cynipiformis*, which, in the larval stage, is parasitic in the cocoons of the ant *Camponotus aethiops*, made near Montrieux (Var.), France, are reported.

Importation and laboratory breeding of two chalcid parasites of Pseudococcus brevipes (Ckll.), W. CARTER (*Jour. Econ. Ent., 30 (1937), No. 2, pp. 370–372, fig. 1*).—In work by the Hawaiian Pineapple Producers' Experiment Station a bisexual strain of the chalcid parasite *Hambletonia pseudococcina* Compere from Brazil failed to reproduce on the pineapple mealybug, but a parthenogenetic strain of *H. pseudococcina* from Colombia and Venezuela, as well as *Anagyrus coccidivorus* Dozier, reproduced on colonies of the pineapple mealybug in Hawaii. Satisfactory reproduction occurred on mealybug colonies established on young growing fruits enclosed in celluloid cages.

On the biology of certain species of Holcocneme Kon. (Hymenoptera: Symphyta), H. W. MILES (*Ann. Appl. Biol., 23 (1936), No. 4, pp. 781–802, pls. 2, figs. 4*).—The large larch sawfly *H. erichsoni* Htg., *H. caeruleocarpa* Htg. which feeds on willow and poplar, *H. lucida* Panz. which feeds on species of *Prunus*, and *H. crassa* Fall. which feeds on willow, poplar, and dock and is widely distributed in Great Britain are considered.

ANIMAL PRODUCTION

[Livestock investigations in Illinois] (*Illinois Sta. Rpt. 1935, pp. 73–93, 100–113, 115–120, 128–134, figs. 2*).—Beef cattle studies include the grazing value of bluegrass, orchard grass, and bromegrass pasture, lespedeza hay v. alfalfa hay for feeding steers, lespedeza straw in the winter ration of dry cows, dry lot compared with pasture for fattening beef calves, soybean oil meal v. cottonseed meal in the fattening ration, and tankage as a satisfactory protein supplement for steers, all by H. P. Rusk and R. R. Snapp; protein supplements required by hogs following fattening cattle, by Snapp; the effect of soybean hay and of pasture on the fat color in carcasses, and the effect of violent exercise just before slaughter on the color of beef, both by S. Bull; simplified methods for estimating the values of feeds and rations, the better utilization of balanced rations, and the failure of cystine amine to substitute for cystine in animal nutrition, all by H. H. Mitchell and T. S. Hamilton; and the relative contents of vitamins B and G in soybeans and corn, by Mitchell and J. R. Beadles.

In swine studies, results were reported on alfalfa pasture for growing and fattening swine and for brood sows, protein supplements for fattening 100-lb. pigs in dry lot, hulled oats in the swine ration and bonemeal as a supplement to hulled oats, and simplified rations for sows and pigs, all by W. E. Carroll and W. P. Garrigus; optimum protein levels for pigs of various weights, by Carroll and Mitchell; and the levels of iron and copper required for normal blood formation, by Mitchell and Hamilton.

Sheep tests yielded information on lespedeza as fall pasture for lambs, and supplemental corn silage v. soybean hay for sheep, both by W. G. Kammlade.

Tests by E. Roberts and J. H. Quisenberry demonstrated hereditary differences in corn which make certain kinds preferable to animals.

Poultry investigations reported include the value of various soybean meals for chick feeding, and the value of mineral feeding on interior egg quality, both by H. J. Sloan and L. E. Card; and the vitamin E requirement of chicks for normal development, and the protective action of yolk material against vitamin deficiency in chicks, by Sloan, Card, and F. B. Adamstone.

[Livestock investigations in Indiana] (*Indiana Sta. Rpt. 1936, pp. 22–24, 25–27, 56–59, 65, 66, figs. 5*).—Beef cattle studies reported include the comparative value of protein concentrates as supplements to rations for fattening calves, the value of limestone in rations for fattening calves, the comparative value of oat straw with limestone v. clover hay with and without limestone as dry roughages in beef cattle fattening rations otherwise containing shelled corn, cottonseed meal, and silage, and of leguminous roughage v. nonleguminous roughage with a protein concentrate for wintering cows with fall calves, the comparative cost of wintering cows with spring calves v. those with fall calves, and the relative cost of raising and fattening spring v. fall calves and native heifers v. steer calves.

Swine tests yielded information on the optimum calcium-phosphorus ratio in rations for swine; the effect of soybeans and soybean products on the quality of pork; ear corn compared with shelled corn for spring pigs; the relative values of roasted soybeans, soybean oil meal, and tankage as supplements in brood sow and pig rations; and the relation of shrinkage and fill to warm dressed yield in hogs.

Results of sheep studies are noted on grain for young lambs; suitable rations for poorly nursed lambs; the necessity of pasture in economic lamb production; the relative gains, finish, cost, and profit from shorn v. unshorn

native lambs; wintering breeding ewes; fattening western lambs; and the effect of calcium and phosphorus supplements in the ration on the formation of urinary calculi.

From poultry studies results are noted on marketing eggs under U. S. grades and on a graded basis, soybean oil meal in broiler rations, the use of large amounts of corn in laying rations, the influence of condensed buttermilk on egg yield, optimum protein levels in rations for young ducks, poultry housing, and the inheritance of growth tendencies in chickens.

Growth and metabolism studies with rats are noted on the cystine deficiency of raw and heated soybeans.

[Livestock investigations in Tennessee], M. JACOB (*Tennessee Sta. Rpt. 1936, pp. 19–24*).—Beef cattle studies reported include the comparative value of cottonseed meal, a mixture of cottonseed meal and tankage, peanut meal, and soybean meal in the wintering and finishing rations for 2-year-old steers, conducted at the main station; the amount of grain necessary for finishing 2-year-old steers on grass and the profitability of winter finishing baby beeves at the Middle Tennessee Substation; the amount of grain necessary for most economical finishing of baby beeves when they have free access to winter, spring, and summer pasture at the West Tennessee Substation; and the comparative value of shelled corn, ground shelled corn, and corn, cob, and husk meal when each is fed with cottonseed meal, alfalfa hay, and silage in the winter finishing of baby beeves at both the Middle and West Tennessee Substations.

Results are noted on the value of feeding grain to breeding ewes and to the lambs in the production of early spring lambs at the Middle Tennessee Substation.

[Livestock investigations in Washington] (*Washington Sta. Bul. 342 (1936), pp. 20–22, 23–25, 54–56*).—Information is presented on cereal and legume hays for fattening cattle, by R. McCall and H. Hackedorn; and the nutritive value of cereal hays and of first- and second-year sweetclover hay, and the value of field mixtures of Albit wheat and sweetclover as a hay and silage crop, all by J. Sotola and Hackedorn.

In poultry investigations results were noted on the chemical nature of watery white in eggs, by J. L. St. John; the protein requirements of chicks and of laying hens, all by J. S. Carver, V. Heiman, St. John, J. W. Cook, and H. W. Gerritz; the vitamin G requirement of poultry, the utilization of fish byproducts for poultry, and the vitamin G potency of dried milk products, all by Heiman and Carver; and the effect of hereditary and environmental factors on the interior quality of the egg, and the effects of storage conditions on egg quality, both by L. A. Wilhelm and Heiman.

Composition of some African foods and feeding-stuffs mainly of vegetable origin (*Imp. Bur. Anim. Nutr. [Aberdeen], Tech. Commun. 6 (1936), pp. 32*).—This is a tabulation of the composition (including organic constituents and in many cases ash analyses) of 566 items of food and feeding stuffs common to Africa. Sections on the composition of salt licks, edible earths, and native salts, and the geographical classification of foodstuffs, and an extensive bibliography are appended.

The composition and feeding value of heather at different periods of the year, B. THOMAS (*Jour. Min. Agr. [Gt. Brit.], 43 (1937), No. 11, pp. 1050–1055*).—Data are presented on the composition of heather at five different growth stages and from areas 3, 5, and 7 yr. after burning. It appears that young heather has the highest feeding value in early summer and that thereafter its value declines, reaching a minimum in early winter. This variation is most pro-

nounced on the area 3 yr. after burning, while at 7 yr. the seasonal variation is very slight. Heather is characterized by a medium protein content, a high ratio of true to crude protein, and a relatively constant crude fiber content at all seasons, with no evidence of an inverse relationship between crude protein and fiber.

Soft corn—how to store and feed it (*Illinois Sta. Circ. 293, Sup.* (*1935*), *pp.* [*6*]).—This mimeographed supplement (E. S. R., 52, p. 369) presents additional information on ways of utilizing soft corn for beef cattle feeding to the best advantage, by H. P. Rusk, and general suggestions for the storage of corn, by E. W. Lehman, G. H. Dungan, and P. E. Johnston.

The chemical composition of grass silage, S. J. WATSON and W. S. FERGUSON (*Jour. Agr. Sci.* [*England*], *27* (*1937*), *No. 1, pp. 1–42, figs. 3*).—This contribution from the Jealott's Hill Research Station, Berks, presents the results of analyses, including pH, crude protein, volatile base, amino acid, lactic acid, total volatile acid, acetic acid, and butyric acid, of 293 samples of silage. The majority of these were made from grassland herbage, while a limited number from ordinary silage crops, sugar beet tops, and potatoes were also included. Various lots of silage were prepared by the ordinary method, with additions of either molasses, whey, or moderate amounts of mineral acid with and without molasses, and by the A. I. V. process.

The additions of molasses, whey, or moderate amounts of mineral acid materially reduced the pH below that occurring in ordinary silage, and a still lower pH was attained in the A. I. V. lots. Volatile acid production, particularly butyric acid, increased as the pH of silage increased, but at pH ranges below 4.5 the quantity of butyric acid produced appears to be negligible for all practical purposes. The ordinary method proved unsatisfactory for high protein silage. Silages of similar pH were adjudged of equal quality regardless of the process employed.

The losses of dry matter and digestible nutrients in low-temperature silage, with and without added molasses or mineral acids, S. J. WATSON and W. S. FERGUSON (*Jour. Agr. Sci.* [*England*], *27* (*1937*), *No. 1, pp. 67–107*).—In this report of further silage studies the losses of dry matter and digestible nutrients incurred in the making of silage by different processes, based on the difference in analyses of the fresh material and the silage as removed, are presented in tabular form and discussed. It is concluded that while the A. I. V. process gives silage with the lowest losses, the advantage over the molasses process is not sufficient to justify its general application in preparing silage from grassland herbage. The ordinary process proved satisfactory when material in an advanced stage of maturity was ensiled.

Plant extracts in the nutrition of guinea pigs and rabbits, A. G. HOGAN and S. R. JOHNSON (*Soc. Expt. Biol. and Med. Proc.*, *35* (*1936*), *No. 2, pp. 217–221*).—In this report from the Missouri Experiment Station it is shown that a deficient basal diet causing acute muscular dystrophy in guinea pigs and rabbits may be made entirely adequate by the addition of 10 percent of alfalfa meal to the diet. In attempts to substitute certain vegetable oils for alfalfa meal a corn oil gave a close approach to adequacy, and wheat germ oil proved very potent in this respect. A test ration of ground oats 60 percent, skim milk powder 33, wheat germ oil 4, and cod-liver oil, sodium chloride, and calcium carbonate, 1 percent each, invariably supported rapid growth in these animals but proved grossly inadequate during the reproductive stage. The juice from young barley plants offered ad libitum in place of drinking water rendered a deficient basal diet entirely adequate for guinea pigs. Further data are presented on the results of adding varying levels of concentrated plant juice, alcohol extract of dehydrated alfalfa, ether extract of dehydrated alfalfa,

alcohol extract of plant juice, and combinations of the latter two to such deficient diets. Varying degrees of protection were afforded by these supplements, but minimum protective doses were not established by this study.

The biological value of the proteins in hegari and the supplemental value of certain protein concentrates used in farm animal feeding, M. C. SMITH and G. H. ROEHM (*Jour. Agr. Res.* [U. S.], *54* (1937), *No. 2, pp. 135–146*).—In an investigation at the Arizona Experiment Station both growth- and nitrogen-balance experiments were conducted with rats fed rations in which hegari served as the only source of nitrogen or was partly substituted with certain protein concentrates. The hegari proteins were inadequate for the support of growth and had a low biological value. Protein-rich feeds which showed definite supplemental relations with hegari proteins included skim milk powder, alfalfa leaf meal, soybean oil meal, meat scrap, gelatin, and tankage, while of the feeds tested only cottonseed meal and wheat gluten exerted no supplemental effect.

In a series of paired feeding experiments, lysine showed a marked ability to supplement hegari proteins, while tryptophane and cystine did not. Apparently lysine deficiency is a major cause for the low biological value of hegari, and proteins rich in this amino acid have a strong supplemental value.

Deficiencies known and suspected in live-stock nutrition of New Zealand, C. S. M. HOPKIRK (*New Zeal. Jour. Agr.*, *53* (1936), *No. 4, pp. 200–204*).—This is a brief résumé of livestock nutritional deficiency problems in New Zealand, with particular reference to iodine, phosphorus, calcium, magnesium, iron, and cobalt.

Studies on the mode of action of vitamin K, H. DAM, F. SCHØNHEYDER, and E. TAGE-HANSEN (*Biochem. Jour.*, *30* (1936), *No. 6, pp. 1075–1079*).—In this phase of their vitamin K investigations the authors show that it is possible to precipitate prothrombin from the plasma of normal chicks (methods described), while the corresponding precipitate from the plasma of K-avitaminous chicks gave no evidence of prothrombin activity. The precipitate from the normal plasma remained active after extraction either with acetone and ether or alcohol and ether, while the lipoid fraction removed by such extraction showed no prothrombin activity. A concentrate of vitamin K did not accelerate the clotting in vitro when tested against plasma and thrombokinase. The lipoid fraction and the prothrombin fraction of a very yellow plasmata were found to contain 323 and 142 units of vitamin K per gram, respectively, but further study is needed to determine whether vitamin K is a constituent of more concentrated prothrombin preparations.

Effect of different methods of grazing on native vegetation and gains of steers in northern Great Plains, W. H. BLACK, A. L. BAKER, V. I. CLARK, and O. R. MATHEWS (*U. S. Dept. Agr., Tech. Bul. 547* (1937), *pp. 19, figs. 2*).—This is a report of grazing investigations at the Dry Land Field Station, Ardmore, S. Dak., covering a period from 1919 through 1933, and planned to compare the effects of different methods of grazing native pastures on the vegetation and on the amount of gain of the grazing steers. The grazing areas consisted of an 80-acre pasture continuously overgrazed; a 150-acre pasture for continuous moderate grazing; and two 80-acre pastures for alternate intensive grazing, using one the first half of the season and the other the last half. The vegetation of the pastures included many species, with four grasses, namely, western wheatgrass, buffalo grass, blue grama, and plains bluegrass furnishing over 90 percent of the total feed. During the course of the investigation protected areas were clipped at 10, 20, 30, and 40 days and at the end of the season to represent various intensities of grazing.

The production of wheatgrass was seriously affected by frequent clipping and plains bluegrass to a less extent, while the yields of buffalo grass and blue grama were only slightly affected. No plants in the pastures appeared to benefit from close grazing or frequent clipping. The intensively and continuously grazed area (80 acres) carried an average of 12 animals annually during the first 6 yr., 10 animals during the second 6-yr. period, and 8 animals during the last 3 yr. Average per head and per acre annual gains for this area were 195 and 27.5, 129 and 16.1, and 162 and 16.2 lb. for the three periods, respectively. The moderately and continuously grazed area (150 acres) carried an average of 12 steers annually for the first 6 yr. and 10 head annually for the second 6 yr. This area was discontinued during the last 3-yr. period, 80 acres of it being used for grazing with steers receiving ground barley as a supplement. Average per head and per acre annual gains for this area were 248 and 18.9 and 191 and 12.7 lb. for the first and second periods, respectively, while steers receiving barley supplement (1931–33) averaged 270 pounds' gain per head and 27 pounds' gain per acre. The areas grazed intensively but alternately (160 acres) carried an average of 24 steers for the first 6-yr. period and 16 steers for the second 6-yr. and the last 3-yr. periods. Average per head and per acre gains were 200 and 29.3, 173 and 17.3, and 191 and 19.1 lb. for the three periods, respectively. Ordinarily the grazing season extended from May 21 until October. In most instances maximum gains were made in June, with gains becoming successively lower for each succeeding month on the continuously grazed areas and with heavy weight losses generally encountered in October. In the brief trial with barley as a supplement to pasture the rate of gain of steers was materially increased, but in only one year out of three was the increased sale value of steers sufficiently great to offset the additional cost of the barley.

Maintaining a commercial beef cow herd, G. A. Branaman (*Michigan Sta. Quart. Bul., 19 (1937), No. 3, pp. 155, 156*).—The feed required to maintain a commercial beef herd is indicated, with particular reference to the feed budget for wintering the cows and the ability of cows to utilize large amounts of low quality roughage.

Red, white, and roan, A. H. Sanders (*Chicago: Amer. Shorthorn Breeders' Assoc., 1936, pp. IX+630, [figs. 60]*).—This book discusses the origin of the Shorthorn breed of cattle in Great Britain and its early introduction into America, and deals particularly with the more important phases of the progress of this breed in the United States during the past three decades.

Sheep farming, A. Fraser (*London: Crosby Lockwood & Son, 1937, pp. 178, figs. 24*).—This book gives an insight into the present status of the sheep industry in the British Isles and deals with the practical aspects of the care and management of the farm flock. "It is written from the point of view of the field rather than the laboratory. . . . It will be read with interest not only by sheep farmers and shepherds, but by all who are interested in the country."

Feeding and management experiments with brood sows and litters, C. M. Vestal (*Indiana Sta. Bul. 413 (1936), pp. 44, fig. 1*).—This bulletin presents the details of 19 experiments with sows and their litters.

Corn alone gave good results as a gestation ration for mature sows when they were so fed and exercised as to maintain a medium condition but was unsatisfactory when such sows were allowed to become fat. It was not suitable as a gestation ration for gilts regardless of condition or amount of exercise. Corn and oats proved a satisfactory gestation ration for either sows or gilts when medium condition was maintained. Condition during gestation was a more important factor than exercise on the ability of sows to raise pigs. When tankage was added to the corn and oats ration, differences in con-

dition and exercise during gestation did not materially affect the pig-producing efficiency of sows and gilts.

Soybeans without minerals were not satisfactory as a supplement in either the gestation or suckling rations. Soybeans with minerals were as satisfactory as tankage in supplementing corn but were not satisfactory as a substitute for tankage and oats in the gestation ration, and their use in suckling rations as a substitute for tankage gave inconclusive results.

Mineral mixtures fed as supplements to brood sow rations were of questionable influence, but apparently best results were obtained when the grain and minerals were fed separately. Dried kelp fed alone or in mineral mixtures did not improve the rations.

Sows maintained in medium condition required approximately 1⅓ lb. and fat sows about 2 lb. of feed daily per 100 lb. of live weight. The average weights of mature sows and of gilts at weaning time were approximately 20 lb. and 40 lb., respectively, greater than their average weights at breeding time.

In addition to the above experiments a summary of data from the experimental swine herd from 1921 to 1935 indicated that 2-year-old sows were more productive than gilts or older sows. The rate of gain of suckling pigs increased with increase in birth weight. As the size of litters increased the average birth weight of pigs decreased. The order in which pigs were farrowed in the litter was not definitely related to their birth weight, and less than 50 percent of pigs weighing 2 lb. or less at birth survived to normal weaning age.

The use of concentrates with factory buttermilk in fattening bacon pigs, C. P. McMeekan (*New Zeal. Jour. Agr., 53 (1936), No. 6, pp. 340–353*).—This contribution from the Massey Agricultural College reports results of three series of feeding trials with fattening bacon pigs. In the first of these buttermilk as the sole diet was compared with buttermilk supplemented with either meat meal, a mixture of meat meal and wheat pollards, or a cereal meal; in the second series buttermilk alone was compared with buttermilk supplemented with cereal meal at various levels; and in the third series buttermilk alone was compared with buttermilk supplemented with cereal meal over varying weight ranges.

The data indicate that from 700 to 800 gal. of buttermilk will produce 100 lb. of dressed meat in pigs fattened from weaning stage to bacon weight. The economy of adding concentrate supplements depends on the relative values of the bacon and such feeds. In general, concentrate feeding should be limited to from 1 to 1.5 lb. per 100 lb. of live weight daily. The concentrate should be fed particularly during the early stages of growth, while "topping off" pigs on meal should be avoided when milk supplies are adequate.

Pig testing: An analysis of the results of bacon pig testing, S. Berge (*Meld. Norges Landbr. Høiskole, 16 (1936), No. 8–9, pp. 641–840, figs. 54; Eng. abs., pp. 833–837*).—This extensive report is based on studies with the Landrace and Large White breeds of bacon pigs and crossbreds from these breeds. Successive sections of the report deal with the manner in which the feed consumption of a litter varies in relation to the time used in increasing from 20 to 90 kg live weight; the growth rate of pigs in the first 8 weeks after farrowing, with information on average birth weights and average length of gestation periods; the growth of bacon pigs particularly during the period from 20 to 90 kg, with an analysis of variation in growth of individuals at different growth stages, and the correlation between growth rates at different periods of development; the growth of breeding animals from birth to 3 yr. of age; and an analysis of the variance of certain characters examined.

The oxygen uptake of pork and bacon: A factor in the production and preservation of the colour of bacon, J. Brooks (*Jour. Soc. Chem. Indus., Trans., 55 (1936), No. 3, pp. 12T–14T*).—The author has measured the oxygen uptake of pork and bacon, employing samples of varying thickness subjected to a wide range of temperature. The respiratory quotient of bacon has also been determined.

At 0° C. the relative rates of diffusion and uptake of oxygen are such as to reduce the oxygen concentration of the sample to zero except in the thin surface layer, and the depth of the oxygen layer decreases with rising temperature. Hence, in considering the factors affecting the formation of nitric oxide hemoglobin in such tissue, the complex effect of oxygen may be ignored. This absence of oxygen in the bulk of the tissue tends to insure stability of color, since nitric oxide hemglobin seems to be stable indefinitely in the absence of oxygen, whereas in the presence of oxygen it is slowly converted to methemoglobin.

Poultry feeds and feeding, G. Robertson and H. S. Gutteridge (*Canada Dept. Agr. Pub. 541 (1936), pp. 38, figs. 11*).—This bulletin presents information on the physical and chemical nature of a wide range of feeding stuffs suitable for poultry feeding, along with practical suggestions on the compounding of rations and methods of feeding different types of fowl.

The evolution of a sanitary type of chick feeder, L. Van Es and J. F. Olney (*Nebraska Sta. Bul. 306 (1937), pp. 14, figs. 13*).—This bulletin describes a series of chick feeders constructed and tried out in the course of evolving a feeder which would entirely prevent fecal contamination of the feed. Working plans are presented for the construction of a feeder which proved fairly adequate in this respect.

Digestibility trials with poultry, VII, VIII, E. T. Halnan (*Jour. Agr. Sci. [England], 27 (1937), No. 1, pp. 126–142*).—This is a continuation of a series of studies previously noted (E. S. R., 63, p. 166).

VII. *The digestibility of wheat offals, with a note on the apparent discrepancy between the digestibility coefficients and nutritive values of these products.*—Trials were conducted to compare the digestibility of broad bran, straight-run middlings, and fine middlings, each product being fed as the sole diet to four Light Sussex cockerels in the respective trials, each of which extended over a 16-day collection period. The digestibility of crude fiber was very low in all products, while digestibility of other constitutents was relatively low in the bran, much higher in straight-run middlings, and highest in fine middlings, with the exception of crude protein digestibility which averaged highest in the straight-run middlings. In addition brief feeding trials with growing chicks are reported, giving evidence that the inclusion of bran in the chick ration is justified on dietetic grounds in spite of its relatively poor value as measured by digestion trials.

VIII. *The digestibility of dried molasses sugar-beet pulp.*—Employing the same experimental procedure as above, the digestibility of a mixture of 10 parts of dried molasses beet pulp and 40 parts of fine wheat middlings was determined. Using the digestibility values for fine middlings as determined in the previous trial, the apparent digestibility of the dried beet pulp was extremely low, averaging 17.5 percent for organic matter, 33.5 for crude protein, 22.1 percent for nitrogen-free extract, and 0 for crude fat and crude fiber. These findings are discussed with reference to the possible depression of the digestibility of middlings in the mixture, and are briefly compared with the findings of other investigators.

Further studies on the growth factor required by chicks: The essential nature of arginine, A. Arnold, O. L. Kline, C. A. Elvehjem, and E. B. Hart (*Jour. Biol. Chem., 116 (1936), No. 2, pp. 699–709, fig. 1*).—Continuing this line of investigation (E. S. R., 73, p. 370), the authors have confirmed previous findings on the growth-promoting activity of water-extracted liver residue when used as a supplement to a yellow corn-wheat middlings-casein diet for chicks. Of other supplements tested in this respect pork heart and soybean meal were almost as potent as the liver residue, wheat germ, pork kidney, spleen, muscle, and brain were less active than the liver residue, and added quantities of yeast or casein in the diet gave no response in added growth.

Edestin, peanut meal, and liver residue each were found to have a growth-promoting action proportional to their arginine content when used as a supplement to the above basal diet. Direct supplements of arginine in the form of the carbonate or hydrochloride at the rate of 1 percent to the yellow corn-middlings-casein diet or a dextrin-casein-peanut oil diet gave rapid growth response. The results indicate that arginine is an essential amino acid for chicks which apparently is not supplied at an optimum level in ordinary grain rations during the rapid growth period.

Preliminary observations on the relationship between production, fertility, and hatchability of eggs, M. R. Montemayor (*Philippine Jour. Anim. Indus., 3 (1936), No. 6, pp. 467–476, figs. 3*).—Information is presented on the seasonal variation in production, fertility, and hatchability of eggs of the Single Comb White Leghorn, Rhode Island Red, and Cantonese breeds under Philippine conditions. The results failed to establish any definite relations between fertility and hatchability or between production and fertility of the eggs.

Effect of temperature, humidity, and other factors on hatch of hens' eggs and on energy metabolism of chick embryos, H. G. Barott (*U. S. Dept. Agr., Tech. Bul. 553 (1937), pp. 46, figs. 18*).—These experiments were designed to determine the effect of varying the temperature, humidity, oxygen concentration, or carbon dioxide concentration in the incubator on the percentage of hatch and the energy metabolism of the developing chick embryo. Selected fresh White Leghorn eggs were incubated in specially designed, constant-temperature, continuous-water-flow calorimeters which also functioned as closed-type respiration chambers.

In determining the effect of temperature variations the following were used: 96°, 98°, 99°, 100°, 102°, and 103.5° F., while a relative humidity of 60 percent, a carbon dioxide concentration below 0.5 percent, and an oxygen concentration of 21 percent were maintained constantly. Maximum hatch was obtained at 100°. The higher the temperature the greater was the energy metabolism and rate of gaseous exchange of the embryos and the earlier the hatch. The length of the incubation period was 19⅝ days at 103.5°, 20¼ days at 100°, and 23½ days at 96°.

Relative humidities ranging from 8 to 88 percent were employed with a temperature of 102°, carbon dioxide below 0.5 percent, and oxygen at 21 percent constantly maintained. The optimum humidity for hatch under these conditions was 58 percent. In a second series, in which a constant temperature of 100° was employed, optimum humidity was found to be 61 percent. In both series as humidity varied either way from the optimum the hatch became less and the energy metabolism of the embryos became lower. The greater the deviation from the optimum the greater was the detrimental effect. Water elimination of the embryo was primarily dependent on the humidity of the atmosphere and declined in direct proportion to increase in humidity (E. S. R., 77, p. 235).

Variations in carbon dioxide concentration with oxygen held constant at 21 percent had very pronounced effects. With 4-percent carbon dioxide less than one-fourth as many chicks were hatched as with 0.5 percent, and only a 16-percent batch was obtained when the carbon dioxide was allowed to accumulate to 10 percent and maintained constant at that level for the remainder of the incubation period. Metabolism was greatest at the lowest concentration and decreased with increase of carbon dioxide. When the oxygen percentage was variously held at 15, 18, 21, 30, 40, and 50 percent the best hatches were obtained at the 21-percent level. Hachability declined as the concentration varied either way, but a decrease was much more harmful than an increase. Gaseous exchange and heat elimination were practically the same at 21, 30, and 40 percent but were retarded at 18- or 50-percent levels, and at 15 percent the effect was very detrimental. Information is given on the respiratory quotient and thermal quotient at various stages of incubation. They indicate a carbohydrate metabolism during the first few days of incubation and almost exclusively a fat and protein metabolism after about the tenth day.

It is concluded that, under the conditions indicated, incubation temperature should not vary more than 0.5° from the 100° optimum, that relative humidity may vary 10 percent from the 61 percent optimum with little detrimental effect, that carbon dioxide concentration should not exceed 1 percent, and that oxygen concentration should not fall below 21 percent.

A new species of micro-organism (Proteus melanovogenes) causing black rot in eggs, A. A. Miles and E. T. Halnan (*Jour. Hyg.* [*London*], *37* (*1937*), *No. 1, pp. 79–97, fig. 1*).—In an investigation of the cause of a black rot occasionally observed in imported eggs, the specific causative organism was isolated and has been described. This organism proved markedly putrefactive, and the name *P. melanovogenes* has been provisionally assigned to it. It produced rot experimentally either when inoculated into fresh eggs or when brushed on the shell of such eggs. In a small number of trials hens inoculated with the organism laid eggs which failed to develop the specific rot. The organism has been found in a number of places, including English soils and manures, but its source, general distribution, and the conditions necessary for infection were not determined.

Turkey production: Suggestions for West Virginia, T. B. Clark and H. M. Hyre (*West Virginia Sta. Circ. 73* (*1937*), *pp. 16, figs. 7*).—Included in this practical circular are suggestions on selection, feeding, and management of the breeding flock, incubation, brooding the poults, management of growing turkeys, marketing, killing and dressing, and sanitation practices.

A statistical study of squab production in the White King breed, C. S. Platt (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 3, pp. 235–237, fig. 1*).—The New Jersey Experiment Stations have studied the relation between total weight of squabs produced annually and certain observed factors in 138 pairs of White King pigeons. The mean annual weight of squabs per pair of pigeons that survived a year was 225.9 ± 3.57 oz. Coefficients of correlation between total weight of squabs and other factors observed were total number of squabs 0.9512 ± 0.0055, percentage fertility of eggs 0.5874 ± 0.0476, percentage livability of squabs 0.5002 ± 0.0431, egg production per pair 0.2877 ± 0.0526, percentage hatchability of fertile eggs 0.1470 ± 0.0562, and average squab weight 0.0010 ± 0.0568.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products] (*Illinois Sta. Rpt. 1935, pp. 140–153, figs. 5*).—In dairy cattle studies, results are briefly noted on methods for evaluating dairy sires, by W. W. Yapp; the relative effects of age

and size of cows on milk yield, by W. L. Gaines; lespedeza hay v. alfalfa hay for milking cows, by W. B. Nevens; pasture improvement studies by Nevens, Yapp, and A. F. Kuhlman; and the relative composition of the milk of five dairy breeds, by O. R. Overman and O. F. Garrett.

Studies with dairy products gave results on the character of yellow color in milk, by Yapp and Kuhlman; the use of acidophilus milk in ice cream manufacture, and methods of producing high quality cream, both by M. J. Prucha; simple methods in dairy sterilization, by Prucha and J. M. Brannon; and the relation of coli and aerogenes groups of bacteria to milk sanitation, by Brannon.

[Investigations with dairy cattle and dairy products in Indiana] (*Indiana Sta. Rpt. 1936, pp. 29–34, 59, 60, 65*).—Included in this report are the results of studies on the value of legume hay and cracked corn as a winter ration for yearling heifers; the effect of soybeans in the ration on the fat test of milk and on the vitamin A value of butter; the rate of change in the vitamin A content of milk when rations are varied; the vitamin A requirements of cows for the production of butterfat of a maximum vitamin A value; the determination of carotene in butter; the relationship of carotene content to the vitamin A value of butterfat; the enzymes in sweet and sour farm-skimmed cream as related to keeping qualities of butter; the effectiveness of lye and chlorine solutions for sterilizing milking machines; certain factors related to the development of cappy flavor in milk; the influence of H-ion concentration and season of the year on the keeping quality of commercially manufactured butter; the frequency of occurrence of yeasts and molds and *Escherichia-Aerobacter* organisms in Indiana butter; the lecithin content of milk and its products; physical, chemical, and bacteriological factors affecting the body, texture, and quality of ice cream; the influence of a milk plant quality program on quality improvement of the milk and on the price paid to producers; and difficulties encountered in the application of the cream sediment test.

[Abstracts of dissertations] (*Iowa State Col. Jour. Sci., 11 (1936), No. 1, pp. 54–56, 78–80, 105, 106, 113, 114*).—Abstracts of the following doctoral theses from the Iowa State College are included: The Influence of Various Procedures on the Flavor and Keeping Quality of Butter, by N. E. Fabricius; A Study of Some Lipolytic Microorganisms Isolated from Dairy Products, by H. F. Long; Gastric Digestion of Soybean Flour When Used as a Substitute for Cows' Milk in Feeding Dairy Calves, by L. N. Shoptaw; and Bacteriological Studies on Some Defects of Cream Cheese Spreads, by J. B. Stine.

[Dairy cattle feeding and grazing experiments in Tennessee] (*Tennessee Sta. Rpt. 1936, pp. 24, 63, 64, figs. 2*).—Tests were reported from the West Tennessee Substation on the amount of grain necessary for most economical milk production when cows have access to all-year pasture, by B. P. Hazlewood; and from the Middle Tennessee Substation comparing the production of cows on a full-grain with those on a half-grain ration, by M. Jacob.

[Investigations with dairy cattle and dairy products in Washington], R. E. Hodgson, J. C. Knott, E. V. Ellington, H. K. Murer, R. R. Graves, E. L. Overholser, C. C. Prouty, and H. A. Bendixen (*Washington Sta. Bul. 342 (1936), pp. 25–31*).—Dairy cattle studies, in cooperation with the U. S. D. A. Bureau of Dairy Industry, yielded information on the feeding value of artificially dried forage crops and of green stacked forage crops, the nutritive value of home-grown hay and silage rations for dairy cattle and of pea cannery refuse, the composition and apparent digestibility of the flat pea, the determination of apparent digestibility by modified procedures, and the utilization of cull apples as a feed for dairy cattle.

Studies with dairy products gave results on the effect of pasteurization upon the bacterial content of high quality milk, the growth of micro-organisms in milk from infected udder quarters, and the value of the H-ion determination of the butter serum in the scoring of butter.

Dry vs. succulent roughage in the dairy ration, O. M. CAMBURN, H. B. ELLENBERGER, J. A. NEWLANDER, and C. H. JONES (*Vermont Sta. Bul. 412 (1937), pp. 12*).—This bulletin presents the results secured in four feeding trials with milking cows in which rations containing only dry roughage were compared with those containing both dry and succulent roughages. In two trials, including one double reversal and one continuous trial, timothy hay replaced fresh corn silage in the ration on a dry matter basis and in the other two, including both a reversal and a continuous trial, artificially dehydrated silage replaced normal corn silage in the ration. All cows had constant access to drinking water.

No significant advantage could be ascribed to either type of ration, the average daily yield of 4-percent milk, the total water intake, the water intake per pound of 4-percent milk, and the total digestible nutrient requirement per pound of 4-percent milk being very similar on the two types of rations. *It appears that dairy cows having free access to drinking water secure enough water whether fed a succulent or nonsucculent ration, that there is little to be gained by furnishing any water in the form of succulent roughage, and that the value of a feed is measured primarily by its digestible nutrient content and not by its water content.*

Some factors affecting breeding efficiency in dairy cattle, G. E. TAYLOR (*Michigan Sta. Quart. Bul., 19 (1937), No. 3, pp. 156–159*).—An analysis of the breeding records of a tuberculosis- and Bang's disease-free dairy herd, including the Jersey, Guernsey, Brown Swiss, Ayrshire, and Holstein breeds, indicated that there is no advantage in breeding heifers at an earlier age than from 17 to 18 mo. in an effort to improve their breeding efficiency, that heifers require more services per conception than older animals, and that the practice of breeding cows so that they will freshen once in every 12 mo. is to be recommended since further delay generally caused an increase in the number of services required per conception.

Changes in weight of new born dairy calves as related to the method of feeding, C. L. COLE (*Jour. Dairy Sci., 20 (1937), No. 2, pp 113–116*).—The Minnesota Experiment Station has recorded daily weights of three groups of calves from birth to 14 days of age. Calves in one lot were removed from their dams immediately after birth without nursing, those in the second lot were left with their dams for 48 hr., and in the third lot for 96 hr. after birth. *The calves allowed to nurse for 2 days or longer did not suffer a loss in weight immediately following birth but rather showed immediate gains, while calves removed from their dams without nursing showed a loss in weight during the first 48 hr. Calves not allowed to nurse were much easier to teach to drink milk and seemed to get a better start during the first 14 days than those calves allowed to nurse for a short period.* Calves in lots 1, 2, and 3 weighed 65.7, 65, and 65.6 lb., respectively, at birth and 80.4, 71.8, and 69.8 lb., respectively, at 14 days of age.

The heat denaturation of albumin and globulin in milk.—II, Denaturation and degradation of protein at temperatures of 75–120° C, S. J. ROWLAND (*Jour. Dairy Res.* [*London*], *8 (1937), No. 1, pp. 1–5*).—Continuing this study (E. S. R., 71, p. 91), milk was heated for various periods within a higher temperature range than was previously employed. Denaturation of albumin

and globulin took place rapidly and was complete in approximately 60, 30, 10 to 15, and 5 to 10 min. at 80°, 90°, 95°, and 100°, respectively. Heating milk at temperatures up to 100° did not change the nonprotein content, but when heated at 115° and 120° the denaturation of the albumin and globulin was followed by an appreciable hydrolysis, resulting in considerable increases in the proteose and nonprotein nitrogen contents.

The soluble protein fraction of milk, S. J. Rowland (*Jour. Dairy Res. [London] 8 (1937), No. 1, pp. 6–14, figs. 2*).—In a series of normal milk samples the maximum amount of albumin and globulin rendered coagulable by heating the milk represented an average of 76 percent of the total soluble protein nitrogen present. Reasons are advanced for the conclusion that the soluble protein fraction of normal fresh milk is composed of about 76 percent of true albumin and globulin and 24 percent of secondary proteins of a proteose-peptone nature.

Oxidized flavor in milk, II–IV (*Jour. Dairy Sci., 19 (1936), Nos. 11, pp. 671–682; 12, pp. 753–760, figs. 2; 20 (1937), No. 3, pp. 133–145*).—These articles are in continuation of a series (E. S. R., 73, p. 837).

II. *The effects of homogenization, agitation, and freezing of milk on its subsequent susceptibility to oxidized flavor development,* L. M. Thurston, W. C. Brown, and R. B. Dustman.—It is demonstrated that homogenization, prolonged agitation at low temperature, and freezing and thawing of milk greatly reduce or completely eliminate its susceptibility to the development of oxidized flavor, even when containing minimal amounts of copper. Although the three treatments differ in their effect on the physical constitution of milk, there is a great similarity in the effect of each as regards oxidized flavor. It is suggested that each process probably causes some realignment of the materials, particularly lecithin, which are adsorbed on the fat globule. Additional evidence has been secured that lecithin is the constituent of milk affected when oxidized flavors develop, although the manner in which either lecithin or butterfat is protected from oxidization by the above treatments has not been demonstrated.

III. *The time of copper contamination during production and processing, and aeration versus no aeration as related to oxidized flavor development,* W. C. Brown, L. M. Thurston, and R. B. Dustman.—All milk used in this phase of the study was from cows known to produce milk readily susceptible to oxidation. The milk was drawn and transported in aluminum utensils, and all pasteurization and cooling were carried out in glass equipment. In the pasteurization studies milk was pasteurized at 143° F. for 30 min., and copper was added to the various samples in amounts ranging from 0.5 to 2.5 p. p. m.

Contamination of the milk with copper after pasteurization resulted in a more frequent and more intense development of oxidized flavor than did contamination with identical amounts of copper before pasteurization, while additions of copper to unpasteurized milk gave results quite similar to those obtained by contamination after pasteurization.

In the cooling studies no significant differences were detected in the intensity of oxidized flavor in milk samples containing like amounts of copper cooled over a surface cooler or by use of an internal cooler.

IV. *Studies of the relation of the feed of the cow to oxidized flavor,* W. C. Brown, L. M. Thurston, and R. B. Dustman.—Studies on samples of mixed herd milk collected once a week throughout 1 yr. and carefully handled to prevent unintentional iron or copper contamination indicated that (1) mixed herd milk never developed oxidized flavor when no iron or copper was added to it, (2) much more iron than copper was required to produce oxidized flavor, and (3) the changing of the cows from dry feeding to a dry feeding and pasture regime caused the milk to become nonsusceptible to oxidized flavor develop-

ment. Considerable variation was noted among individual cows with respect to the tendency for oxidized flavor to develop in their milk. The addition of 1 qt. of either tomato or lemon juice or of ½ g of pure crystalline ascorbic acid per animal daily to the rations of cows in dry feeding greatly reduced the susceptibility of the milk to oxidized flavor development.

The production of milk of abnormal composition by animals free from udder streptococci, E. G. HASTINGS and B. A. BEACH (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 3, pp. 199–220*).—In this study by the Wisconsin Experiment Station, the production of milk of abnormal composition in a herd of 31 Holstein cows which had had no contact with other cattle either during or for 1 yr. prior to the period of observation was studied during their first lactation period. Periodic samples of foremilk from the separate quarters of each animal were analyzed for chlorine, for catalase, and for pH value, and were cultured on glucose agar and in milk. Additional samples of foremilk and of the entire product of each quarter from animals producing abnormal milk were further examined as to composition and bacterial content.

On the basis of commonly accepted standards for normal milk, namely, a pH value below 6.8, a chlorine value below 0.15 percent, and a catalase value of under 50 percent, one or more samples of milk which would be classed as abnormal were obtained from 23 of the 31 cows, and on final analysis of the records 14 of the cows were considered definitely abnormal while 17 were considered normal. The abnormalities noted were such as to indicate a chronic inflammation of low intensity in the quarters involved. No streptococci were found in any sample, thus eliminating *Streptococcus agalactiae* as the cause. No significant differences were demonstrated in the types of bacteria found in the quarters producing normal and abnormal milks, suggesting that the disturbance may be due to an increased development of common udder flora over that in normal udders. The results did not indicate that this condition passed from one animal to another in the herd.

A comparison of ten presumptive test media used in the detection of the Escherichia-Aerobacter group in milk, M. A. FARRELL (*Jour. Dairy Sci.*, *20* (*1937*), *No. 2, pp. 67–75*).—In this study at the Pennsylvania Experiment Station, 66 samples of raw and certified milk were planted into each of the 10 presumptive test media compared, namely, lactose broth, buffered lactose broth, brilliant green lactose bile broth 2 percent, fuchsin lactose broth, methylene blue bromocresol purple broth, crystal violet lactose broth, formate ricinoleate broth, gentian violet lactose broth, MacConkey's peptone lactose bile broth, and trypaflavine broth. Samples were incubated and the results recorded according to standard methods.

The brilliant green lactose bile broth, fuchsin lactose broth, and methylene blue bromocresol purple broth were found to be equally efficient in the detection of the *Escherichia-Aerobacter* group, while the remaining 7 media proved definitely less efficient in this respect. These data have been employed to determine the accuracy of the "most probable number" index as a measure of density of this group of organisms in milk. The method was found to be very inaccurate with certain of the media tested. The opinion is expressed that there is need for the development of a more efficient presumptive test medium for the detection of the *Escherichia-Aerobacter* group of organisms in milk.

Variants of Streptococcus lactis which do not ferment lactose, E. S. YAWGER, JR., and J. M. SHERMAN (*Jour. Dairy Sci.*, *20* (*1937*), *No. 2, pp. 83–86*).—The [New York] Cornell Experiment Station reports the isolation from milk of four cultures of *S. lactis* which failed to curdle milk. When subjected to numerous cultural tests these cultures were shown to agree with typical *S. lactis* strains in all respects except their lack of ability to ferment lactose.

It is recommended that these organisms be recognized as naturally occurring variants of *S. lactis*. In support of this view, one of these strains, after 10 months' cultivation, has acquired the ability to ferment lactose feebly.

Fermentative variability among substrains of Streptococcus cremoris and Streptococcus lactis obtained from pure cultures, J. M. SHERMAN and R. V. HUSSONG (*Jour. Dairy Sci., 20 (1937), No. 2, pp. 101–103*).—In this study at the [New York] Cornell Experiment Station, a parent culture of *S. cremoris* which would not ferment either maltose or sucrose and a parent culture of *S. lactis* which would ferment maltose but not sucrose were employed. Of 458 substrains developed from the former only 217 were typical of the parent stock, while 229 were maltose+ sucrose−, 11 were maltose− sucrose+, and 1 was maltose+ sucrose+. Of 757 strains of *S. lactis* developed, 756 were typical of the parent and only 1 was maltose+ sucrose+. These data are interpreted to indicate that it is doubtful if a differentiation between these two species can be founded on fermentation tests.

Further studies on home pasteurization of milk, E. D. DEVEREUX, C. S. BRYAN, and D. H. LAURENT (*Michigan Sta. Quart. Bul., 19 (1937), No. 3, pp. 172–175*).—Continuing these studies (E. S. R., 76, p. 242), milk samples containing mastitis streptococci and contagious abortion bacteria were heated to various temperatures and for various time intervals in an ordinary double boiler, in bottles submerged in an open water bath, and in bottles in a pressure cooker. It is concluded that both types of organisms in the milk were completely destroyed with a reasonable margin of safety when heat was so applied that the water in the double boiler or in the water bath containing the bottled milk would boil in approximately 18 min. These organisms in bottled milk in a pressure cooker were destroyed when all air was expelled from the cooker and a steam pressure of 5 lb. was maintained for 5 min. In addition, any of the above heat treatments reduced the total bacterial content of the milk over 99 percent. Immediate cooling after pasteurization, storing in a cold place, and prevention of recontamination insured a low count milk.

Twenty-second annual report of the creamery license division, T. H. BINNEY (*Indiana Sta. Circ. 224 (1936), pp. 16*).—This circular indicates the number of creamery licenses issued and the number of testers' licenses granted during the year ended March 31, 1936, and lists the licensed dairy manufacturing plants in Indiana.

Body of cultured cream, E. S. GUTHRIE (*[New York] Cornell Sta. Bul. 666 (1937), pp. 12, figs. 8*).—This bulletin presents information on the effect of certain plant practices and the addition of various substances on the smoothness, dryness, and viscosity of cultured cream. Pasteurization temperatures at about 165° F. with a 30-min. holding period and homogenization at approximately 3,000 lb. per square inch gave the smoothest, driest, and most viscous body, while homogenization temperatures of from 145° to 165° were most desirable, depending on the thickness of body desired. Rehomogenizing at pasteurizing temperatures or slightly below increased the firmness, dryness, and viscosity of the body. The addition of skim milk powder to raise the solids-not-fat content distinctly increased the viscosity without affecting the texture of the body. The use of rennet resulted in a firmer and more viscous body, while the use of gelatin noticeably increased viscosity but produced a lumpy texture and a body that lost moisture. A ropy starter had little effect on the viscosity of the cultured cream. Increasing the fat content from 18 to 24 percent resulted in decreased viscosity, but maintaining a constant solids-not-fat to fat ratio as the fat content was increased from 18 to 24 percent gave a body of uniform viscosity.

Some factors affecting the properties of whipping cream and the quality of the finished product, W. S. Mueller, M. J. Mack, and H. G. Lindquist (*Massachusetts Sta. Bul. 335 (1936), pp. 23, figs. 19*).—This bulletin presents information on the whipping ability of cream and on the viscosity, overrun, and serum drainage of the finished product as influenced by various factors.

Whipping temperatures above 40° F. for 36-percent cream reduced maximum stiffness and percentage overrun and increased the serum drainage of the whipped cream. A separation temperature of 90° produced a more satisfactory whipping cream than temperatures above 100°. Standardizing either before or after pasteurization, using either skim milk or whole milk for standardizing and varying pasteurization temperatures from 145° to 165°, did not noticeably affect whipping qualities. Cream containing 30 percent butterfat whipped satisfactorily. No practical advantage of aging cream more than 24 hr. was noted.

In a study of the effect of adding up to 0.6 percent of such substances as Kraftogen, dehydrated sodium caseinate, Dariloid, gelatin, Vegetable Gelatin, dehydrated egg albumin, and dehydrated egg yolk, the only marked benefit observed was the elimination of serum drainage by the use of 0.3 percent gelatin or 0.4 percent of either Dariloid or Vegetable Gelatin. All of these substances except Kraftogen and sodium caseinate reduced the overrun, and all except sodium caseinate and Vegetable Gelatin reduced the whipping ability of the cream. In general, the practice of adding such substances cannot be recommended.

Increasing the serum solids from 6.3 to 11 percent by addition of either skim milk powder or condensed skim milk slightly decreased the whipping ability and the serum drainage, but the benefits were not sufficiently great to justify the practice. Up to 15 percent sugar may be added at any time after the first minute of whipping without detrimental effect, but before pasteurization or immediately before whipping are the least desirable times to add sugar. Reconstituted cream did not compare favorably with ordinary cream in whippability or flavor. Homogenization, delayed cooling after pasteurization, or partial freezing (up to 50 percent solid) had no significant effects on the whipping quality of the cream. Total freezing before pasteurization destroyed the whipping properties of the cream, but total freezing after pasteurization had only a slight detrimental effect. Varying the source of protein in the cow's ration from vegetable to animal origin had no effect in this respect.

Controlling the flavor of butter, H. A. Ruehe (*Natl. Butter and Cheese Jour., 28 (1937), No. 4, pp. 20–22*).—In a report from the Illinois Experiment Station it is shown that the distillation of properly prepared butter starters yields a distillate rich in diacetyl and acetylmethylcarbinol which may be added to butter churned from unripened cream to produce the desired intensity of flavor. The flavoring qualities of the starter distillate can be standardized on the basis of its diacetyl content, since it is shown that little loss in diacetyl occurs over an extended storage period at 40° F. Most judges favor a butter containing the distillate flavor at the rate of less than 1 part of diacetyl to 200,000 parts of butter.

A further study of the factor in soybeans affecting the vitamin A value of butter, S. M. Hauge, J. W. Wilbur, and J. H. Hilton (*Jour. Dairy Sci., 20 (1937), No. 2, pp. 87–91, fig. 1*).—With further reference to the factor in soybeans which exerts a suppressing action on the formation of vitamin A in butter (E. S. R., 75, p. 245), milking cows fed a standard basal ration of white corn, oats, alfalfa hay, and corn silage received various supplements in the form of

linseed oil meal, raw soybeans, expeller-type soybean oil meal, linseed oil meal plus 5 percent of either linseed oil or soybean oil, soybeans extracted with ether and alcohol, linseed oil meal plus ether extract from soybeans, and linseed oil meal plus alcoholic extract from soybeans. Milk samples from cows on the various rations were churned frequently, and the butter was assayed for vitamin A potency.

The vitamin A-suppressing factor was found to be present not only in the raw soybeans but also in the soybean oil and the soybean meal secured by either the expeller process or by chemical solvents. No suppressing action resulted from the presence of linseed oil in the ration, indicating that a factor in the soybean oil itself and not merely the presence of oil in the ration is the causative agent. Prolonged extraction of soybeans first with ethyl ether and then with ethyl alcohol failed to remove this factor completely. The feeding of alcoholic extract of soybeans did not produce a significant suppressing effect, indicating that this factor is not soluble in ethyl alcohol.

Diacetyl in cold-stored butters, II, C. R. Barnicoat (*Jour. Dairy Res.* [*London*], *8* (*1937*), *No. 1, pp. 15–30, fig. 1*).—Continuing this series of studies (E. S. R., 76, p. 387), experiments were conducted to study the derivation of diacetyl in starter butters and to follow the distribution of diacetyl and acetylmethylcarbinol during the butter-making process. Neutralization and pasteurization partially destroyed the carbinol fraction in cream, while the diacetyl content was practically unchanged. Both principles were retained in butter with the buttermilk fraction. Butter churned from sweet cream, mild starter cream, and high acid cream contained approximately 0.05, 0.3–0.4, and 1.5 p. p. m. of diacetyl, respectively, these contents remaining fairly constant during 3.5 months' storage at 14° F. The diacetyl content tended to increase when butter was held at 40° for several days after manufacture, which was attributed to the dehydrogenase activity of the starter organisms or their enzymes. Neither keeping quality nor vitamin A content of butter was affected by its diacetyl content.

The coagulation of milk with rennet: Some experiments with slow-renneting and soft-curd milks, F. H. McDowall, R. M. Dolby, and A. K. R. McDowell (*Jour. Dairy Res.* [*London*], *8* (*1937*), *No. 1, pp. 31–52, figs. 7*).—A series of experiments on the renneting of milk was started at the New Zealand Dairy Research Institute in 1930 because of occasional difficulties experienced with the rennet coagulation of milk in cheese factories. In general, such difficulties are not due to the tendency of some individual cows habitually to give soft-curd milk but rather to the spasmodic occurrence of soft-curd milk from herds generally producing normal milk. In these studies it has not been possible to establish any relationship between the composition of milk, particularly the calcium and phosphorus contents or the calcium: phosphorus ratio, and the type of curd obtained. The occurrence of slow-renneting soft-curd milk is more prevalent during periods of dry weather and certain districts are more liable to encounter such difficulties than others, but no causal factor for the sudden appearance of the trouble has been discovered.

The cheese yielding capacity of milk, and its relation to the method of payment for milk for cheesemaking, F. H. McDowall (*New Zeal. Jour. Sci. and Technol.*, *18* (*1936*), *No. 3, pp. IX+137–364, figs. 45*).—This extensive report includes a comprehensive review of the literature and the presentation of much original data. Comparisons are made of three systems of payment, namely, on a cheese test based on the casein-fat ratio in the milk, on a cheese test based on the content of casein plus fat in the milk, and simply on the fat content of the milk. Payment on the basis of the first-named test is considered

preferable. A system of payment embodying this test and also making allowance for the volume of milk handled by a plant and designated as a "costed cheese" system is recommended as one that would give an equitable distribution of payments to all suppliers.

The reactions and properties of annatto as a cheese colour, with particular reference to the chemistry of cheese discoloration, C. R. BARNICOAT (*Jour. Dairy Res. [London], 8 (1937), No. 1, pp. 61–73, figs. 3*).—This study shows that the intensity of color of commercial annatto solutions is not quite proportional to the dilution, that cheeses of high acidity tend to be deeper in color than the average, and that there is a proportionality between the color of cheese and the initial concentration of annatto in the milk. Methods are described for the extraction of the annatto color from milk products. It appears that the development of bleached and pink discolorations in cheese is due to an oxidation process, and the effect of oxidation on annatto solutions is indicated.

Limitations to the use of skimmilk powder and butter in the ice cream mix, P. S. LUCAS and J. JENSEN (*Michigan Sta. Quart. Bul., 19 (1937), No. 3, pp. 147–155*).—Mixes containing 20 percent of fat from butter whipped similarly to those made entirely from cream. When a high percentage of the fat content was supplied from butter, it was possible to obtain overrun more rapidly and to a somewhat greater degree, but the resulting ice cream showed an increasing tendency towards coarseness in texture and a lower resistance to melting. Aging mixes 48 hr. instead of 24 hr. increased whippability and improved the body and texture of the ice cream, particularly in mixes containing a large proportion of fat from butter, but did not affect melting properties. Spray-process skim milk powder and condensed skim milk appeared to be equally desirable as a source of serum solids, although use of the former gave mixtures possessing slightly better whipping qualities.

The Kniaseff method for finding the fat content of ice cream, D. H. NELSON (*Ice Cream Trade Jour., 32 (1936), No. 11, pp. 19, 20*).—In a critical study of this test method (E. S. R., 73, p. 236), the author points out certain difficulties encountered in performing routine tests. It is concluded that, while this method cannot replace the Mojonnier method, its simplicity, rapidity, and accuracy make it the choice of all the modifications of the Babcock method.

VETERINARY MEDICINE

[Report of work in animal pathology and parasitology by the Illinois Station] (*Illinois Sta. Rpt. 1935, pp. 93–100, 113, 114, 120–126, 127, 134–139, figs. 6*).—The work of the year reported upon (E. S. R., 74, p. 538), by R. Graham, E. H. Barger, F. Thorp, Jr., J. P. Torrey, E. Roberts, W. E. Carroll, J. A. Hunter, H. W. Johnson, L. E. Card, and J. H. Quisenberry, includes brief reference to the importance of control of shipping fever (hemorrhagic septicemia) of cattle, control work with Bang's disease, infectious abortion of swine, checking of Johne's disease of cattle through repeated testing and sanitation, swine resistance to hog cholera, control of parasites in horses, fatal encephalitic disease (commonly referred to as cornstalk disease of horses) (E. S. R., 76, p. 852), control of pullorum disease, control of laryngotracheitis of chickens through vaccination, hereditary resistance to pullorum disease (E. S. R., 74, p. 701), and the value of pigeon pox vaccine for control of fowl pox (E. S. R., 75, p. 403).

[Work in animal pathology by the Indiana Station] (*Indiana Sta. Rpt. 1936, pp. 24, 47, 67–70*).—Reference is made (E. S. R., 75, p. 840) to a characteristic organism thought to be one of the prime causative factors of abortion in guinea pigs, transmission of paralysis in chickens by inoculation,

immunization studies of Bang's disease, a study of the death loss in newborn pigs, hog cholera serum tests, urinary calculi in sheep, agglutination tests for infectious abortion in cattle and in hogs and for pullorum disease, encephalitis, worm parasites in quail, and results of diagnoses of animal diseases.

[Work in animal pathology and parasitology by the Tennessee Station] (*Tennessee Sta. Rpt. 1936, pp. 25, 26, figs. 2*).—Brief reference is made to control work with Bang's disease, by Jacob (E. S. R., 76, p. 102), and to the progress of poultry yard sanitation investigations, by Allen (E. S. R., 76, p. 695) and Jacob.

Report of the chief veterinary research officer, R. Daubney (*Kenya Dept. Agr. Ann. Rpt., 1935, vol. 2, pp. 130–162*).—The work of the year (E. S. R., 76, p. 244) is reported upon at some length, particular attention being given to rinderpest, horse sickness, malignant catarrh of cattle, and swine influenza.

Paralysis in fowls and scrapie in sheep (a comparison), A. Brownlee (*Jour. Compar. Path. and Ther., 49 (1936), No. 4, pp. 328–335*).—A comparative examination, presented with a list of 23 references to the literature on paralysis in fowls and scrapie in sheep, shows that the two diseases have many features in common.

Phagocytic activity of bone-marrow cells, I. F. Huddleson and M. Munger (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 1, pp. 27–29; abs. in Michigan Sta. Quart. Bul., 19 (1937), No. 3, p. 195*).—The unusual opportunity offered by the vigorous opsonic response to the parenteral injection of antigenic fractions of *Brucella* cells for measuring the phagocytic activity of the various types of bone-marrow cells collected directly from the marrow, or as they are found in the peripheral blood in myelogenous leukemia, led to the observations here reported. The inference drawn from the studies is that, in infections where mature neutrophiles are being rapidly destroyed, the bone marrow in an attempt to replace the cells destroyed forces out into the peripheral blood a high percentage of young forms which play little if any part in the protection of the individual against the infection. It would appear, therefore, that a too rapid or continuous shift to the left in peripheral blood cells of the myelogenous series is not a desirable condition. Its continuance impairs one of the important defensive mechanisms of the body during infection.

The chronic toxicity of carbon tetrachloride: Animal exposures and field studies, H. F. Smyth, H. F. Smyth, Jr., and C. P. Carpenter (*Jour. Indus. Hyg. and Toxicol., 18 (1936), No. 5, pp. 277–298*).—In a study of the effect of the inhalation of carbon tetrachloride, it was definitely shown that an animal continuously exposed to from 50 to 400 p. p. m. of carbon tetrachloride soon regenerates originally damaged liver cells, and somewhat later regenerates damaged kidney cells while the exposure continues. The regenerated cells are more resistant than the original.

A liver preparation protecting against necrosis from chloroform or carbon tetrachloride administration, J. C. Forbes, R. C. Neale, and J. H. Scherer (*Jour. Pharmacol. and Expt. Ther., 58 (1936), No. 4, pp. 402–408, figs. 4*).—This is a report upon a preparation of a liver concentrate which when injected into rats protects them to a marked extent against carbon tetrachloride and chloroform poisoning. The active principle is not choline, glucose, or the pernicious anemia factor.

The importance of cobalt in the treatment of certain stock ailments in the South Island, New Zealand, H. O. Askew and J. K. Dixon (*New Zeal. Jour. Sci. and Technol., 18 (1936), No. 2, pp. 73–92, figs. 9*).—This contribution appears in two parts, with a preface by T. Rigg.

I. *Cobalt in the treatment of bush-sickness at Glenhope, Nelson, N. Z.*, H. O. Askew (pp. 74–84).—The author has found the use of cobalt chloride in drench form supplying 8 mg of cobalt per week to be completely successful in overcoming bush sickness at Glenhope. "The cobalt contents of drench materials employed in previous years [E. S. R., 73, p. 106] at Glenhope and in the Sherry Valley show agreement between high cobalt content and efficacy of the drench material. The high cobalt content of [Nelson soil] (Whangarei limonite (Reyburn)), when considered in conjunction with its efficacy in overcoming both Glenhope ailment (in Sherry Valley) and bush sickness (in North Island), suggests that cobalt is of great importance in the treatment of certain types of stock ailments in different parts of New Zealand. Data are not available to make a statement concerning the occurrence or otherwise of a cobalt deficiency in Glenhope pastures. It is known, however, that the cobalt content of Glenhope soil is particularly low (0.4 p. p. m. of cobalt, compared with 43 p. p. m. found in Nelson soil).

"The experiments detailed above do not prove, in the absence of knowledge of the cobalt content of pasture, that bush sickness is due to a deficiency of cobalt. Knowledge of the Glenhope ailment does definitely suggest, however, that it is caused by a mineral deficiency and that cobalt, so potent in overcoming the ailment, is probably present in deficient supply."

II. *Cobalt in the treatment of a sheep ailment, Morton Mains, Southland*, J. K. Dixon (pp. 84–92).—"A lamb sickness in Southland known as Morton Mains disease can successfully be controlled by the use of small quantities of cobalt. The evidence is in favor of the assumption that the effectiveness of certain soil drenches in the past was due to their cobalt content."

A reaction with iron compounds for the determination of B. anthracis and of its pathogenicity, E. De Angelis (*Jour. Bact., 33 (1937), No. 2, pp. 197–206*).—A new type of chemical test for the identification of the anthrax organism (*Bacillus anthracis*) is described.

"There are two procedures for obtaining the reaction, the direct and the indirect, and both give positive and negative results. Virulent cultures of *B. anthracis* give positive direct and indirect reactions, avirulent strains of *B. anthracis* give negative direct and positive indirect reactions, *B. subtilis* and other spore-bearing bacilli tested give negative direct and indirect reactions. There is a definite relationship between the strength of the reaction and the potency of the strains of *B. anthracis*. Little of the chemistry is known, but the fact is definitely established that a union of iron ions, whether ferric, ferrous, or both, with a product produced by the *B. anthracis* takes place. The substance seems to be derived from the gelatin portion of the medium. Out of some 30 different organisms tested, only *B. anthracis* has been found to give the reaction. Some bacteria which prevent anthrax when they are simultaneously injected into rabbits, guinea pigs, and mice with *B. anthracis* have also shown similar antagonistic action on this reaction."

The influence of tuberculosis upon the development of Brucella abortus infection, E. J. Pullinger (*Jour. Hyg. [London], 36 (1936), No. 3, pp. 456–466*).—The difficulty of isolating *B. abortus* from samples of contaminated milk by means of guinea pig inoculation has been found due in certain instances to the presence of tubercle bacilli in the inoculum, although this is deemed probably not the full explanation. "Following the simultaneous inoculation of virulent tubercle bacilli and *B. abortus* into guinea pigs, the latter infection generally failed to become established, whereas control animals inoculated under the same conditions with *Brucella*, but without tubercle bacilli, became infected. Results of the inoculation of the two organisms into opposite sides

of guinea pigs indicate a generalized as well as a local increase of resistance to *B. abortus*. It is suggested that the mononuclear cell reaction stimulated by the tubercle bacilli destroyed *B. abortus*."

The chemical constitution of the endo-antigen of Brucella cells, R. B. PENNELL and I. F. HUDDLESON (*Jour. Bact., 33 (1937), No. 1, p. 42*).—A fraction constituting approximately 25 percent by weight of the dried cell, has been repeatedly isolated from organisms of the genus *Brucella*, the chemical analysis of which is briefly reported upon. It is responsible for the toxic action noticed upon intraperitoneal injection of *Brucella* cells into normal guinea pigs. The fraction precipitates immune serum in dilutions of from 1:400,000 to 1:1,000,000 and is actively antigenic.

Growth zones of the Brucella in semi-solid media, C. E. ZOBELL and K. F. MEYER (*Jour. Bact., 33 (1937), No. 1, pp. 44, 45*).—It was found that "when semisolid nutrient agar is seeded with a dilute suspension of *B. abortus* growth appears in a narrow zone 5 to 8 mm below the surface of the medium, the zone of recently isolated cultures being narrowest and deepest. *B. melitensis* growth zones are 2 to 5 mm below the surface, and *B. suis* multiplies on the surface to a depth of 4 or 5 mm. Studies on 17 recently isolated *B. abortus* cultures supplemented by observations on 450 stock cultures of all strains show that the depth and extent of the growth zones can be controlled to a certain extent by carefully adjusting the oxidation-reduction potential and pH of the medium."

The animal reservoirs of brucellosis, W. A. HAGAN (*Jour. Bact., 33 (1937), No. 1, pp. 39, 40*).—A review of present knowledge of the animal reservoirs of the organisms of the *Brucella* group has led the author to consider it adequately proved that human infections may and do occur as a result of contacts with cattle, goats, and swine, and their secretions. While reliable information is quite limited, there seems to be no doubt but that the horse may sometimes act as a source of infection for other species of animals and for man. On the other hand, it seems quite improbable that sheep, dogs, and fowls ever play such a role, even though they may be invaded by *Brucella* and become reactors to the agglutination test for brucellosis.

The significance of the horse in brucellosis, C. M. CARPENTER and R. A. BOAK (*Jour. Bact., 33 (1937), No. 1, p. 40*).—Epidemiological studies of equine brucellosis indicate that the horse may be a more significant source of infection for man and cattle than is generally recognized. "The examination of serum for *abortus* agglutinins from 347 horses, taken mostly from four stables, showed that 27 percent had a titer of 1:25, 14 percent a titer of 1:50, and 8 percent a titer of 1:100 or higher. Tests on a group of mares, repeated over a period of 2 yr., disclosed that some of them had become infected without presenting clinical evidence of brucellosis. A few of the mares that developed high titers became temporarily sterile. Frequently the titer at the first test was 1:25, while at successive examinations it increased to 1:100 or higher, only to subside later to 1:25 or to disappear. These mares had been in contact with cattle with Bang's disease. Examination of the milk from 5 of the reacting mares that foaled normally revealed no evidence of *Brucella abortus* infection.

"The serum from 2 of 5 horses with fistulous withers reacted at titers of 1:200 and 1:100, respectively, while the remaining 3 contained no *B. abortus* agglutinins. A bovine strain of *B. abortus* was isolated by guinea pig inoculation from the purulent exudate of 1 of these horses. Two children who had contact with this horse developed serious undulant fever."

Results of passage of human and monkey strains of Brucella melitensis through pregnant heifers, D. E. WILSON and S. A. EVANS (*Jour. Compar. Path. and Ther., 49 (1936), No. 4, pp. 336–339*).—A report is made of a case of apparent

mutation of *B. melitensis* (human-monkey passage) to *B. abortus* by passage through a pregnant heifer. Subsequent attempts to repeat this mutation failed, using the same strain and a known human *B. melitensis* strain. That the heifer used in the original experiment carried a latent *B. abortus* infection and that agglutination failed to reveal its presence is considered possible.

The detection of antigenic variants of Brucella by means of the opsonocytophagic test, M. MUNGER, I. F. HUDDLESON, and S. WAKEMAN (*Jour. Bact., 33 (1937), No. 1, pp. 43, 44*).—The opsonocytophagic test has been found to offer an accurate and simple means of detecting antigenic variants in the *Brucella* groups. The employment of this test for the detection of individuals susceptible or immune to *Brucella* infection requires the use of a normal culture.

A study of Brucella infection and immunity in a large county hospital, I. F. HUDDLESON, S. E. GOULD, M. MUNGER, and D. M. PAULSON (*Jour. Bact., 33 (1937), No. 1, p. 44*).—In a study of *Brucella* infection, immunity, and susceptibility of 8,124 hospital inmates, 10.3 percent gave a positive brucellergin skin test. Data were obtained which show the comparative value of the serum agglutination test and the intradermal test in determining *Brucella* infection and immunity, and which show the accuracy of the diagnostic tests on a large group of individuals retested after 7 mo.

Diagnosis of undulant fever: The opsonocytophagic, allergic, and agglutination reactions, A. E. KELLER, C. PHARRIS, and W. H. GAUB (*Jour. Amer. Med. Assoc., 107 (1936), No. 17, pp. 1369–1373, fig. 1*).—The data presented are said to agree with those reported by Huddleson et al. from the Michigan Experiment Station (E. S. R., 70, p. 527; 72, p. 382) on *Brucella* infections of individuals who are either in the active stage of undulant fever or who have recovered and in persons who are living or working under conditions of exposure to this group of organisms.

The observations indicate that the intracutaneous test may be used to determine a state of allergy resulting from *Brucella* infection, and in determining the presence of infection with *Brucella* in individual patients or the incidence of this infection in groups of the population. It gives no indication of the immunity status of the patient, but this may be determined by the opsonocytophagic test. It is possible with the use of these two tests to ascertain whether individuals are susceptible, infected, or immune with regard to undulant fever.

Priority among American physicians in demonstrating the cause of grain itch: Tardy credit therefor given to Dr. Lyman Talmage Rawles, H. E. KITTREDGE (*Jour. Amer. Med. Assoc., 107 (1936), No. 26, pp. 2109–2115*).—The early history of the straw itch mite as the cause of dermatitis is reported upon, with 26 references to the literature.

A culture medium for Erysipelothrix rhusiopathiae, L. R. VAWTER (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 5, pp. 635, 636*).—The author has recently observed in the course of work in Nevada that liver digest solution enriched by the addition of 2 to 4 percent sterile, normal horse serum proved superior to any medium previously recommended for *E. rhusiopathiae*. The medium, which consists of liver digest solution (basal medium), bacto-peptone 1 percent, and sodium chloride 0.5 percent, is adjusted to a pH of 7.6 or 7.7 before sterilization, distributed in tubes or flasks, and sterilized in the autoclave for 20 min. at 15-lb. pressure. After sterilization from 2 to 4 percent of sterile, normal horse serum is added and then incubated for 48 hr. at 37° C. to check on sterility.

It has been found that old stock strains as well as recently isolated strains of the organism grow rapidly in this medium, which has proved excellent for the recovery of either this organism or *Corynebacterium pyogenes* from

polyarthritis lesions in lambs and swine. "Broth cultures attain their maximum growth and turbidity in 24 hr. at 37° without sedimentation. Gram-positive diphtheroid forms predominate at this time with occasional filamentous forms. The density ranges from 2.5 to 3 cm as measured with a Gates opacimeter.

"Agar slants or plates may be prepared by dissolving bacto-agar in the above described fluid media, 2 to 4 percent sterile horse serum being added aseptically after sterilization. Colonies appear on serum-enriched, liver-digest agar after incubation for 24 hr., reaching their maximum size of 0.5 mm in about 48 hr., and are larger than on other media heretofore recommended. Rough and smooth colonies can be readily distinguished on plate cultures after incubation for 48 hr.

"Twenty-four-hour, serumized, liver-digest cultures of *E. rhusiopathiae* can be used as whole culture antigen for the agglutination test by diluting with sterile liver-digest solution, pH 7.6, to a density of 5 cm (Gates scale) and the addition of 0.5 percent phenol, the diluted and phenolized broth cultures being allowed to remain at room temperature for 24 hr. before being used in the agglutination test. Definite agglutination occurs with positive serums after incubation for 8 hr. at 37° and is complete in about 16 hr. Centrifugation of the agglutination tubes is not necessary, as agglutination is sharply defined and more easily read than is the case with some forms of agglutination antigen heretofore recommended.

"Comparison was made using saline suspensions of *E. rhusiopathiae*, alcohol-treated antigen of Deem, and the whole culture antigen described. Commercial anti-swine-erysipelas serum and positive serums from sheep convalescent from erysipelas infection agglutinated all of the antigens in the same dilutions."

Experiments on immunisation against Pasteurella septica infection, F. W. Priestley (*Jour. Compar. Path. and Ther., 49 (1936), No. 4, pp. 340–347*).—A description is given of a method of preparing a vaccine from virulent capsulated *P. septica*. It is shown that this vaccine is able to protect mice against a dose of organisms sufficient to kill all controls and all mice inoculated with the type of vaccine containing only somatic antigen.

Rabies and its transmission by naturally infected haematophagous bats, S. Torres and E. de Queiroz Lima (*Rev. Dept. Nac. Prod. Anim.* [*Brazil*], *2 (1935), No. 1–3, pp. 1–55, pls. 12; Eng., Fr. abs., pp. 43–50*).—Experiments conducted have led the authors to conclude that in the focuses of epizootic rabies as well as out of them hematophagous bats are found that are carriers of the virus. In the inoculations reported upon, the incubation period varied from 10 or 13 days to as long as 202 days in the case of a bat caught in the State of Mato Grosso.

Serological variants of Salmonella typhi-murium, with special reference to S. typhi-murium var. binns, P. R. Edwards (*Jour. Hyg.* [*London*], *36 (1936), No. 3, pp. 348–354*).—Studies of several cultures of *S. typhimurium binns* at the Kentucky Experiment Station revealed the fact that all contained specific components characteristic of *S. typhimurium*. "These cultures lacked the somatic factor V. It is proposed, therefore, to emend the antigenic formula of *S. typhimurium* var. *binns* from IV, V: —:1, 2, 3, to IV: i:1, 2, 3. Under the emended variety would also be included the organisms described by [F.] Kauffmann [3] as *S. typhimurium* var. *copenhagen* and by Edwards [E. S. R., 74, p. 548] as *S. aertrycke* var. *storrs*."

[3] Ztschr. Hyg. u. Infektionskrank., 116 (1934), No. 4, pp. 368–384.

Notes on the survival of the eggs and free-living larvae of sclerostomes on pasture, I. W. PARNELL (*Sci. Agr., 16 (1936), No. 7, pp. 391–397; Fr. abs., p. 397*).—Physical and chemical tests of the bursate nematodes of horses and sheep, which form one of the major sources of loss to the owners of these animals, are reported. A list of 22 references to the literature is included.

On a pleuropneumonia-like organism in lung lesions of rats, with notes on the clinical and pathological features of the underlying condition, E. KLIENEBERGER and D. B. STEABBEN (*Jour. Hyg. [London], 37 (1937), No. 1, pp. 143–152, pl. 1*).—The authors have found *Streptobacillus moniliformis* (i. e., L_1 plus *Streptobacillus*) to be a frequent inhabitant of the nasopharynx of rats with lung lesions, and that it may secondarily invade the lungs since it is found in severe cases together with the L_1 organism.

Biochemical and serological characteristics of streptococci of bovine origin, W. N. PLASTRIDGE and S. E. HARTSELL (*Jour. Bact., 33 (1937), No. 1, pp. 24, 25*).—In continuation of earlier work by the [Connecticut] Storrs Experiment Station (E. S. R., 74, p. 846), biochemical tests and the precipitin test of Lancefield employed in determining the characteristics of streptococci (*Streptococcus agalactiae*) obtained from freshly drawn milk samples are reported upon. The results obtained are considered to indicate that, while either biochemical or serological tests alone may give satisfactory results, both tests are necessary for the final identification of streptococci of bovine origin.

Studies on hemolytic streptococci.—III, Streptococcus equi and related strains, A. C. EVANS (*Jour. Bact., 32 (1936), No. 5, pp. 541–556*).—In continuation of earlier studies (E. S. R., 76, p. 101), the author presents a review of the literature on *S. equi* and describes the characters of the species as observed in 20 cultures isolated in various parts of the United States and in Denmark (4 strains).

"Eleven strains agreed in every character. One of them, No. 725, was chosen as the type strain. Nine strains are regarded as variants because they differ from the type strain in one or more characters and yet resemble *S. equi* more closely than any other species. In a collection of about 400 strains from human disease sources, not one was classified as *S. equi*. The human strains which had been reported by other investigators to be *S. equi* were found to belong to other groups."

A list is given of 31 references to the literature.

Chemotherapy in streptococcic infections (*Jour. Amer. Med. Assoc., 108 (1937), No. 1, pp. 48, 49*).—This is a summary of recent findings in therapeutic work with virulent hemolytic streptococci of human origin in which Prontylin or Prontosil Soluble has been used.

Para-amino-benzene-sulfonamide and its derivatives: Experimental and clinical observations on their use in the treatment of beta-hemolytic streptococcic infection.—A preliminary report, P. H. LONG and E. A. BLISS (*Jour. Amer. Med. Assoc., 108 (1937), No. 1, pp. 32–37, fig. 1*).—Following a brief reference to the recent observations of numerous European investigators that p-aminobenzenesulfonamide (including Prontylin) and certain of its chemical derivatives (including Prontosil) exert a specific chemotherapeutic effect in β-hemolytic streptococci infections, the results of experimental treatment of mice are reported, the details being given in tables. It is concluded that the careful clinical use of this dye and its derivatives in infections due to β-hemolytic streptococci is warranted.

The mode of action of p-aminobenzenesulphonamide and Prontosil in haemolytic streptococcal infections, L. COLEBROOK, G. A. H. BUTTLE, and R. A. Q. O'MEARA (*Lancet [London], 1936, II, No. 23, pp. 1323–1326*).—It is pointed out that no satisfactory explanation has yet been given for the unmistakable

effect of Prontosil (now known as Red Prontosil) and of Prontosil Soluble in controlling hemolytic streptococcal infections in the mouse, and for the apparently analogous curative effects reported in man. The present paper deals with a number of new facts which have recently come to light.

"*p*-Aminobenzenesulfonamide has a bacteriostatic and bactericidal action against small numbers of hemolytic streptococci in culture medium and in blood. Prontosil is inactive, but on reduction an active substance is produced. Following administration of the sulfonamide, or of Prontosil, to man and animals their blood is bactericidal to hemolytic streptococci."

A list is given of 12 references to the literature relating to the subject.

Studies on tuberculosis, J. Barbosa da Cunha (*Rev. Dept. Nac. Prod. Anim. [Brazil], 2 (1935), No. 1-3, pp. 115-126; Eng. abs., pp. 123-126*).—These studies relate to (1) the isolation of the human type of the tuberculosis bacillus from the muscle of a pig and (2) the occurrence of tuberculosis among cattle and swine in the States of Rio Grande do Sul, Paraná, São Paulo, and Rio de Janeiro.

Sources of infection and seasonal incidence of tularaemia in man, E. Francis (*Pub. Health Rpts. [U. S.], 52 (1937), No. 4, pp. 103-113, pls. 2, figs. 2*).—Included in this contribution is a reference to the mammal, insect, and acarid vectors of *Bacterium tularense*, which is known to have reached man directly from over 20 animal sources. Discovered in ground squirrels in Tulare County, Calif., in 1910, human cases have since been recognized in 46 States of the Union and in the District of Columbia.

Ixodes ricinus californicus (Banks), a possible vector of Bacterium tularense, G. E. Davis and G. M. Kohls (*Pub. Health Rpts. [U. S.], 52 (1937), No. 10, pp. 281, 282*).—A record is made of the collection of two naturally infected adults of *I. ricinus californicus* from a recently dead jack rabbit (*Lepus californicus californicus*) near Grants Pass, Oreg., with indications that this tick may be a vector of the causative organism of tularemia.

North American records of the tick Ixodes ricinus californicus (Banks), G. M. Kohls and R. A. Cooley (*Pub. Health Rpts. [U. S.], 52 (1937), No. 10, pp. 282-284*).—The known host and locality records of *I. ricinus californicus*, a common tick of the Pacific coast region and thought to be a vector of *Bacterium tularense*, are here assembled.

The botulism of bovines [trans. title], P. Rossi and F. Vigel (*Rev. Gén. Méd. Vét., 45 (1936), No. 539, pp. 641-670*).—The authors have found botulism to occur in the bovine in France, it being manifested by symptoms similar to those in man. A polyvalent serum and immunization by antitoxins A and B have been used as prophylactic and remedial measures.

A list is given of 50 references to the literature.

The isolation of Brucella abortus from the milk of cows with negative blood reactions to the agglutination test, T. M. Doyle and F. Beckett (*Jour. Compar. Path. and Ther., 49 (1936), No. 4, pp. 320-327*).—In the examination of milk samples from 309 nonreacting cows in 17 *B. abortus*-infected herds by guinea pig inoculation for the presence of the organism, *B. abortus* was isolated from the milk of two cows which had negative blood titers in dilutions of from 1:25 to 1:200. When 684 cows from 17 commercial dairies situated in the south of England were tested for the presence of *Brucella* agglutinins, the average herd infection was found to be about 35 percent.

The value of vaccination with live culture of Br. abortus for the prevention of abortion, H. E. Keylock (*Jour. Compar. Path. and Ther., 49 (1936), No. 4, pp. 350-359*).—In experiments conducted, the details of which are presented in tables, viable abortion vaccine administered to adult animals increased the number of full-term calves by 6.32 percent, decreased abortion by 4.32 percent,

and decreased the retention of the placenta by 2.59 percent. The difference in favor of vaccination is so small that it is thought that over a further length of time it might easily be reversed and that vaccination confers very little, if any, immunity.

In the work with heifers there was such an increase in the number of abortions and sterility that vaccination has been discontinued.

Chronic mastitis, G. J. Hucker (*Conn. Dairymen's Assoc. Rpt. Proc., 55 (1936), pp. 112–121*).—This practical contribution from the New York State Experiment Station was presented as an address at Hartford, Conn., in January 1936.

Dextrose-fermenting aërobes in the spleen and lymph glands of rinderpest infected cattle, M. M. Robles (*Philippine Jour. Anim. Indus., 4 (1937), No. 1, pp. 5–11*).—Records having shown that of 98 serials of rinderpest vaccine prepared and tested in the laboratory of the Philippine Bureau of Animal Industry 3 contained dextrose-fermenting aerobes, a study was conducted to determine the incidence, type, and behavior of such bacteria. It was found that their incidence in the spleen and lymph glands of rinderpest-infected cattle was highest in the visceral and lowest in the body lymph glands, with the spleen occupying an intermediate position. All of the strains isolated belonged to the *coli-aerogenes* group, which points to the digestive tract as the most probable source of contamination. Of those isolated, only 2 proved fatal to guinea pigs. They were able to produce local and general disturbances in cattle. However, none of the strains was able to survive a desiccation of 2 mo. in the ice chest or the disinfecting action of 0.4 percent chloroform for 10 days, thus making the elimination of such contamination feasible under favorable conditions.

Trichomoniasis or trichomonad abortion in cattle, H. Schmidt (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 5, pp. 608–618*).—As a contribution from the Texas Experiment Station, a summary is given of the present status of knowledge of this disease, with a list of 29 references, followed by a brief account of observations on a large dairy herd in Texas in which the disease occurred.

The presence of avian tubercle bacilli in the lymph-nodes of cattle, J. McCarter, E. G. Hastings, and B. A. Beach (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 5, pp. 619–626*).—In examinations made by the Wisconsin Experiment Station of the tuberculous lymph nodes of 28 tuberculin-reacting cattle, examined by cultural methods and by guinea pig inoculation for the presence of acidfast micro-organisms, 3 were found to be infected with avian tubercle bacilli, 23 with mammalian tubercle bacilli, and there were negative results from 2. It is concluded that infection with avian tubercle bacilli is probably responsible for part of the tuberculin reactions in lesion as well as in no-visible-lesion cattle in Wisconsin.

Herrold's egg yolk-agar medium has been found to be completely efficient for the culture of bovine tubercle bacilli from tuberculous guinea pig tissues, but is not quite so satisfactory as the inoculation of guinea pigs for the detection of bovine tubercle bacilli in the tuberculous tissues of cattle.

Artificial thallium moult in sheep, N. A. Iljin (*Jour. Genet., 33 (1936), No. 2, pp. 305–313, pls. 5*).—Accounts are given of the artificial molting of fine wool as well as mixed wool sheep, at the Soviet State Farms in Crimea, by thallium treatments.

Listerella infection associated with ovine encephalitis, E. Jungherr (*Jour. Bact., 33 (1937), No. 1, pp. 112, 113*).—A report is made of five cases of meningoencephalitis associated with *Listerella* infection, observed by the [Connecticut] Storrs Experiment Station in a flock of 200 purebred sheep. "Diagnosis was based in one instance on clinical examination alone, in two on histologic

and bacterioscopic evidence, and in two entirely on cultural isolation of a *Listerella* organism from the affected areas. Pathologically the disease was characterized by mononuclear infiltrations in the regional meningi and by perivascular areas and central polynuclear foci in the medulla oblongata. Similar disturbances were produced in mice by intranasal injection of brain suspension and small doses of *Listerella* culture, while filtered brain material was innocuous. Comparatively large culture doses injected intranasally produced in mice a rapidly fatal septicemia, and in sheep a marked thermic and agglutinative response followed by recovery. Sheep receiving intracarotic injections of *Listerella* culture succumbed to hemorrhagic meningitis. Primary isolation of the *Listerella* organism from field cases was effected on blood sugar agar slants and egg meat medium; subcultures on liver agar plates produced a characteristic milky, slightly opalescent, round, entire colony. Except for minor differences in delayed biochemical reactions, the ovine strains could not be distinguished from two human and one ovine reference strains by morphologic, cultural, agglutination, and agglutinin absorption tests."

Infectious enterotoxaemia and the Clostridium welchii group, with special reference to so-called pulpy kidney in lambs, D. A. Gill (*New Zeal. Jour. Sci. and Technol., 18 (1936), No. 2, pp. 106–119, fig. 1*).—In this contribution the author discusses the general nature of enterotoxemia and the work that led to its dicovery, summarizes the existing knowledge of the causal organism, and deals with methods of prevention and control of the disease.

On the intestinal worms of goats in Nanking, H. W. Wu and T. P. Hu (*Sinensia, 6 (1935), No. 6, pp. 698–700*).—The trematode *Paramphistomum cervi* (Shrank) and the nematodes *Haemonchus contortus* (Rud.), *Oesophagostomum venulosum* (Rud.), and *Trichuris ovis* (Abildg.) were found in the alimentary tracts of goats reared in the vicinity of Nanking that were examined in the spring of 1935.

A comparison of the tube and plate methods of testing for Bang's disease in elk, A. M. Lee and M. E. Turner (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 5, pp. 637–640*).—The results of tests made (1) with the official tube test and (2) with two commercial plate antigens which had been found to give reasonable agreement with the tube test in cattle are reported. The tests were applied to blood samples obtained in December 1935 from 132 elk that were being slaughtered in the herd-reduction program in Wyoming, the details being given in tables. Those which gave complete agglutination in the 1:100 dilution or higher were considered reactors, and those showing complete or incomplete agglutination in the 1:50 dilution were classed as suspects.

"There were 28 reactors (19 percent) out of the 143 tested by the tube test. There were 19 (13 percent) reactors to the plate test with antigen 1, and there were 22 reactors (15 percent) with plate antigen 2. There were 17 suspects to the tube test, 14 to the plate test with antigen 1, and 11 with plate antigen 2. Failure to get reasonable agreement between tube and plate tests with one or both antigens was encountered in 19 of the 143 samples tested. This was over 13 percent." Strong reactors to the tube test were negative to the plate test. In some samples strongly positive to the tube test, plate antigen 2 gave positive results while plate antigen 1 gave negative or suspicious results. On the other hand, 1 sample was positive in dilutions of 1:200 by the tube test and with plate antigen 1, whereas plate antigen 2 gave a positive reaction in only the 1:50 dilution.

The 4 other samples of the 19 mentioned above which were strong reactors to the tube test were tested with 4 plate antigens which gave reasonable agreement with the tube test in cattle.

The tube test with a 72-hr. incubation and a polyvalent antigen was found to be considerably more accurate than the plate or rapid test.

Posterior paralysis in swine, L. P. Doyle (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 5, pp. 656–660, figs. 5*).—A practical summary of information, contributed from the Indiana Experiment Station.

Diagnosis of hog cholera by an intradermal reaction [trans. title], A. Donatien and F. Lestoquard (*Rev. Vét. [Toulouse], 88 (1936), Dec., pp. 657–668*).—Observations reported have led to the perfection of a technic for the diagnosis of hog cholera by an intradermal reaction. The antigen must contain both the hog cholera virus and castor oil if positive reactions are to be obtained.

Distribution of hog-cholera virus among fractions of virus blood, W. C. Powick (*Jour. Agr. Res. [U. S.], 54 (1937), No. 3, pp. 221–233*).—Experiments conducted by the U. S. D. A. Bureau of Animal Industry at Ames, Iowa, in 1929 in an attempt to compare the minimal infective doses of the cells, serum, and certain other fractions of virus blood and to measure the extent to which blood cells of normal pigs can adsorb hog cholera virus from infectious serum are reported. The virus blood was obtained from experimentally inoculated pigs with acute hog cholera. The test pigs were susceptible animals, bred on nearby farms from susceptible sows. Most of the virus of the cholera blood was associated with the cellular elements. The erythrocyte stroma carried an important part of the virus in relatively high concentration, and cells from normal pig blood readily and firmly adsorbed much of the virus from virus serum. Probably no important part of the whole quantity of virus was associated with the leucocytes of hog cholera blood.

Hog cholera is transmissible to the sheep and goat [trans. title], H. Jacotot (*Compt. Rend. Acad. Sci. [Paris], 203 (1936), No. 23, pp. 1297–1299*).—The author has found that hog cholera is readily transmissible through inoculation to the sheep and goat, and that these animals can also be infected by simple cohabitation with affected swine. While the disease is usually inapparent in small ruminants, the virus may be discharged with the excrement.

Preliminary observations on the infectivity of Ascaris lumbricoides to swine, P. A. Clapham (*Jour. Helminthol., 14 (1936), No. 4, pp. 229–232*).—The results obtained from the ingestion of eggs of *A. lumbricoides* by pigs bottle-fed from birth and free from infection are briefly reported upon.

Treatment of impaction in the horse with lentin, the new rapid-acting cathartic, M. V. Burgett and G. W. Bardens (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 5, pp. 646–655*).—The authors have found lentin (carbaminoxylcholine chloride), first introduced into veterinary practice in 1932, to be more effective than arecoline in colic and impaction in the horse. It is more regular and surer in action and is safer than other rapid-acting purgatives—arecoline, eserine, or barium chloride, because it does not depress the circulation.

Brucella abortus in horses, A. W. Deem (*Jour. Bact., 33 (1937), No. 1, pp. 40, 41*).—Brief reference is made to *abortus* agglutination titers which were determined on the blood serums of 189 horses. Thirty-four of these had either fistulous withers or poll evil, or both, and 28 gave positive reactions in serum dilutions of 1:50 or higher. Of the other 155 horses examined, 29 had positive tests in the same range of serum dilutions. Of 103 apparently normal horses in the local field artillery unit, 10 were positive for agglutinins in dilutions of 1:50 or 1:100, none higher. "By direct isolation we were able to obtain *B. abortus* in pure culture from 9 of 15 samples of material obtained from as many previously unopened fistula cases, and from 1 of 2 specimens of synovial fluid in other bursitis conditions. A simplified method for isolating *B. abortus*

from otherwise uncontaminated material is given. We were unable to recover *B. abortus* from pus from any of 5 cases of fistulous withers from 1 to 6 weeks after they were opened."

Transmission of equine encephalomyelitis (California virus) to the vulture (Vultur fulvus Briss.) [trans. title], P. REMLINGER and J. BAILLY (*Compt. Rend. Soc. Biol.* [*Paris*], *123* (*1936*), *No. 30, pp. 562, 563*).—The common vulture of Morocco was found to be susceptible to the western type of the equine encephalomyelitis virus, having succumbed on the fourth day following subdural inoculation.

Infectious tracheo-bronchitis of the horse (*Jour. Roy. Army Vet. Corps*, *7* (*1936*), *No. 4, pp. 188–195*).—A general review of this affection of the horse is followed by a discussion of its clinical relation to known epizootics.

Treatment of experimental surra in native horses by means of the combined suboccipital-intravenous injections of "Bayer 205", L. M. YUTUC (*Philippine Jour. Anim. Indus.*, *3* (*1936*), *No. 6, pp. 459–462*).—In experiments conducted with a view to determining the efficiency of simultaneous suboccipital and intravenous injections of Bayer 205, commonly known as Naganol, three of the seven animals used were able to stand the complete sets of injections, but relapses were noted during and after the treatment. "The dose for suboccipital injection was 0.045 mg in 0.1-percent concentration and for the intravenous injection it was 15 mg in 10-percent solution per kilogram live body weight, respectively. In general the treatment was given every 14 days until three simultaneous injections were administered. . . . Two animals died after the initial injections, while one was killed in extremis after a short period following the last injections. These results indicate that the suboccipital-intravenous injections of Bayer 205, beyond prolonging the course of the infection, are of not much value in the treatment of surra with nervous complications."

Toleration of naganol (Bayer 205) by horses, S. C. J. BENNETT (*Jour. Compar. Path. and Ther.*, *49* (*1936*), *No. 4, pp. 304–309, fig. 1*).—The author has found that in treatment for trypanosomiasis most horses can tolerate naganol to a far greater extent than commonly believed, and that, in spite of undesirable reactions to the drug in many cases they can be maintained in workable condition for some months at least. "No dose of naganol lower than 2 g will check a trypanosomiasis relapse, and the outcome in a horse which is not inherently intolerant of the drug will depend on whether or not the trypanosome infection becomes so severe, in the sense that relapses occur at short intervals, that an intolerable intensity of treatment becomes necessary."

The pathology of Crotalaria spectabilis Roth seed poisoning in the domestic fowl, M. W. EMMEL (*Jour. Amer. Vet. Med. Assoc.*, *90* (*1937*), *No. 5, pp. 627–634, fig. 1*).—A report is made of crotalaria seed poisoning studies of the fowl at the Florida Experiment Station, in continuation of those of Thomas (E. S. R., 72, p. 391). Innumerable petechiae in the serous membranes and visceral fat as well as a dark liver, marbled in color, were the outstanding lesions in the acute type. In the chronic type of poisoning necrotic enteritis, ascites, and anemia were observed, the liver often appearing as in the acute type of poisoning. Passive congestion, edema, cloudy swelling, and occasionally foci of necrosis in the parenchymatous tissues, smooth muscle, and serous membranes dominate the histopathology.

Infectious enterohepatitis, A. J. DURANT (*Jour. Amer. Vet. Med. Assoc.*, *90* (*1937*), *No. 5, pp. 596–607, figs. 2*).—A practical summary of information, contributed from the Missouri Experiment Station.

Primary irido-cyclitis in fowls: A condition distinct from the eye lesions occurring in neuro-lymphomatosis, H. P. BAYON (*Jour. Compar. Path. and*

Ther., *49* (*1936*), *No. 4*, *pp. 310–319*).—The occurrence of outbreaks of iridocyclitis, involving relatively large numbers of fowls, without the appearance of paralysis before, during, or after the development of the eye lesions, suggests that iridocyclitis is not always due to neurolymphomatosis but may occur as a separate disease. "Such birds with primary iridocyclitis, when placed in single-pen cages where they have easy access to food and drink, notwithstanding their blindness will go on laying throughout the season, while fowls with neurolymphomatosis either do not come into lay at all or cease laying the moment the disease is manifest. Though it is admitted that there is no clear-cut difference between the anatomical lesions in the eyes of birds with primary iridocyclitis when compared with those detectable in the eye affection occurring in the course of fowl paralysis, yet the different occurrence and course of the two ailments may be allowed to suggest a distinction in pathology between the localized affection of the eye when occurring alone and the generalized lymphomatosis seen in fowl paralysis. From the standpoint of veterinary medicine it is advisable to treat cautiously the presence of 'pearly eyes' in breeding birds, since it is not always possible to distinguish in the living, on the spot, certain harmless varieties of 'pale eyes' from early and yet dangerous pathological lesions."

Cysteine-gelatin as a differential medium for Salmonella pullorum and Salmonella gallinarum, W. R. Hinshaw and L. F. Rettger (*Soc. Expt. Biol. and Med. Proc.*, *35* (*1936*), *No. 1*, *pp. 44–46*).—A brief report is made of work with cysteine gelatin as another medium for the differentiation of *S. pullorum* from *S. gallinarum*. All 58 of the *S. gallinarum* strains of fowl origin gave a definite positive reaction in cysteine gelatin in the form of a distinct yellowish-white turbidity when incubated at 37° C. for from 24 to 72 hr. The nature of this turbidity has not been definitely determined, but it is not due to profuse growth of the organisms. When stab cultures of the same strain were incubated at 20°, a zone of turbidity developed at the surface and along the line of puncture in from 48 to 72 hr. In shake cultures a similar zone was found around each individual colony. All of the 120 strains of *S. pullorum* of fowl origin produced no changes in the cysteine gelatin, either when incubated at 37° or at 20°. The reactions of the 11 strains of *S. typhi*, all of human origin, in cysteine gelatin more nearly resembles those of *S. pullorum* than *S. gallinarum*.

A composite drop-reaction sheet for the spot method of conducting the whole-blood test for pullorum disease, D. E. Stover (*Jour. Amer. Vet. Med. Assoc.*, *90* (*1937*), *No. 5*, *pp. 661–664*, *fig. 1*).—A description is given of a composite drop-reaction sheet devised with a view to eliminating an outstanding flaw in the spot method of conducting the whole blood test for pullorum disease. The sheet consists of a piece of drop-reaction filter paper and a piece of lens paper placed face to face and attached at the corners with paste.

Titre fluctuation in agglutination tests for pullorum disease in hens, B. H. Edgington (*Poultry Sci.*, *16* (*1937*), *No. 1*, *pp. 15–18*).—Following a brief reference to the literature, this contribution from the Ohio Experiment Station reports upon an investigation in which adult hens showing different titer limits in agglutination tests for pullorum disease were assembled in two groups. In one group the fowls were isolated in individual cages; in the other they were held as a unit in a single pen. The results of the agglutination tests, which were run at monthly intervals over a period of 1 yr., are reported in detail in tables. Titer fluctuations varying as to time of occurrence and degree were observed in each group. There appeared to be no significant difference in sustained trends of titer variations of the two groups that could be attributed to the manner in which the fowls were maintained.

A study of immunity produced by infection with attenuated culture-strains of Histomonas meleagridis, E. E. Tyzzer (*Jour. Compar. Path. and*

Ther., 49 (1936), No. 4, pp. 285–303).—In summarizing studies conducted in continuation of those noted (E. S. R., 71, p. 395), the author reports that various culture strains of *H. meleagridis* have shown no uniformity in regard to the rate of decrease in pathogenicity. "Thus while pathogenicity was lost in 1.5 yr. in one strain, another strain was still mildly pathogenic after 3 yr. Strains which have become nonpathogenic retain for a time well-marked immunizing properties when established in the ceca, but may gradually lose these properties and later on furnish no more than slight or partial protection against inoculation with fully pathogenic strains. Histological study of successive stages of the pathological process resulting from the invasion of the cecal wall by *Histomonas* has revealed qualitative as well as quantitative differences in the reaction of the chicken to different culture strains. On comparing the reaction of partially immunized and those of nonimmunized chickens to pathogenic *Histomonas*, the lesions are found to be microscopically similar, differing only in extent. In birds completely immunized, as judged by gross appearances when killed at appropriate periods after the test inoculation, no invasion of the tissues has been demonstrated microscopically. Notwithstanding the lack of distinctive histological differences in the character of the reactions of the partially protected chickens as compared with those of controls, the modification of the infection in the former is clearly shown in the shortening of the course of infection, in the occurrence of delayed infections, and in the marked limitation of the area of the cecal wall invaded."

The occurrence of Salmonella, Senftenberg type, in a disease of turkeys, P. R. EDWARDS (*Jour. Bact., 33 (1937), No. 2, pp. 193–195*).—Two cultures isolated from young poults in a flock affected with a derangement of the hock joint which caused the foot to turn outward and in which the mortality did not exceed 10 percent were demonstrated by the Kentucky Experiment Station to be members of the Senftenberg type of *Salmonella*. This is said to constitute the first recognition of the Senftenberg type in animal disease.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Illinois Station] (*Illinois Sta. Rpt. 1935, pp. 126, 127, 220–240, figs. 2*).—The progress results are briefly reported of investigations by E. T. Robbins and C. W. Crawford on factors affecting the pulling power of horses and mules; use of electricity in agriculture, by E. W. Lehmann and A. L. Young; farm sewage disposal, by Lehmann and A. M. Buswell; tractor lubrication, by R. I. Shawl; trash covering equipment for plows, by Young, Shawl, and T. Cleaver; soil erosion control, by Lehmann and R. C. Hay; combine harvesting, by Lehmann, Young, and Shawl; harvesting and storage of artichokes, by Lehmann and Shawl; artificial drying of corn, by Lehmann, R. H. Reed, W. L. Burlison, and G. H. Dungan; stationary spraying, by Lehmann, Reed, H. W. Anderson, and R. L. McMunn; apple washing, by Reed; and gas production from farm wastes, by Buswell, Lehmann, and E. E. De Turk.

[Agricultural engineering investigations by the Indiana Station] (*Indiana Sta. Rpt. 1936, pp. 8–16, figs. 6*).—The progress results are briefly reported of investigations on electric fences, electric heaters for fruit washers, use of electric energy in brooding chicks, power consumption of portable and stationary spray plants, electric dairy water heaters, soil heating with electric energy, storage of sweetpotatoes, precooling cantaloups and peaches in refrigerator cars, cornstalk covering equipment, mechanical corn production, mechanical corn picker loss, Canada thistle-control equipment, rubber tires v. steel wheels for tractors, combined harvester-threshers, combining oats, air-cooled apple storages, low-pressure pneumatic tires for manure spreaders, poultry housing, hay and grain drying, and soil conservation.

Measuring equipment used in watershed and hydrologic studies, W. D. Ellison (*Agr. Engin., 18 (1937), No. 3, pp. 107–110, figs. 5*).—In a brief contribution from the U. S. D. A. Soil Conservation Service this equipment is described.

Bibliography on land drainage, compiled by D. W. Graf (*U. S. Dept. Agr., Bur. Agr. Engin., 1936, pp. [1]+245*).—This mimeographed bibliography contains an author index in addition to the list of publications.

Notes on soil mechanics and foundations, F. L. Plummer (*Ann Arbor, Mich.: Edwards Bros., 1936, pp. VII+139, figs. 129*).—This publication summarizes available information on soil dynamics as related to foundations. It contains chapters on the geology of soils; soil properties and soil tests; colloids; mechanical analysis; soil moisture and limits of consistency; subgrade soil classification; permeability; shearing strength, cohesion, and internal friction; compressibility and consolidation; frost action; stress distribution; bearing capacity of soils and piles; settlement of structures; stability of slopes; soil pressure against retaining walls; and soil compaction and proctor tests.

Proceedings of the International Conference on Soil Mechanics and Foundation Engineering, June 22 to 26, 1936 (*Cambridge, Mass.: Harvard Univ., 1936, vol. 3, pp. VIII+268+[1]+18, figs. [380]*).—Papers of significance to agricultural soil dynamics are included on Pressure Distribution, by F. Kögler (pp. 66–70); Discussion on the Distribution of Stress Around a Pile, by R. D. Mindlin (p. 71); A Graphical Method for Determining the Distribution of Stress in the Underground Due to Foundation Loads, by D. M. Burmister (pp. 71–73); A Method for Determining the Shearing Resistance of Fill Materials, Earth Embankments, etc., in Place by Means of a New Shear Apparatus, by D. M. Burmister (pp. 114–116); Discussion on Gilboy's Presentation of Jürgenson's Method of Foundation Analysis, by T. A. Middlebrooks (p. 118); Notes on the Stability of Slopes, by D. W. Taylor (pp. 118–122); Two Examples Concerning Underground Sliding Caused by Construction of Embankments and Static Investigations of the Effectiveness of Measures Provided to Assure Their Stability, by E. von Gottstein (pp. 122–128); Discussion on the Lateral Resistance of Piles, Paper No. H–1, by P. Raes and A. E. Cummings (pp. 138–140); Pressure Distributions on Retaining Walls, by R. D. Mindlin (pp. 155, 156); Direct Measurement of the Permeability of the Ground, by J. P. Daxelhofer (pp. 164, 165); and Comparative Studies of the Effectiveness of Different Methods for Compacting Cohesionless Soils, by W. Loos (pp. 174–179).

Mechanics of materials, S. G. George and E. W. Rettger (*New York and London: McGraw-Hill Book Co., 1935, pp. XII+483, figs. 428*).—This text covers the essential topics of a first course in mechanics of materials. It contains chapters on stress and strain; testing materials; tension and compression; riveted joints; torsion; simple beams, shear, and moment; stress in beams; elastic curve; stress intensities on different planes; columns; nonprismatic and special beams; and slope and deflection, moment area method, theorem of three moments.

The effects of service on automobile crankcase oils, J. I. Clower and N. W. Conner (*Va. Engin. Expt. Sta. Bul. 28 (1937), pp. 40, figs. 14*).—Studies are reported which indicate that all of the changes which an oil in a crankcase undergoes are not deleterious and some are beneficial. For example, film breakdown and viscosity index tend to improve with use. Other properties, such as carbon residue, neutralization number, ash and iron content, hemacytometer count, and precipitation number show a decided tendency to increase, while viscosity, surface tension, dilution, and pour point follow no definite trend but vary widely with operating conditions.

It appears that the importance of the properties of new oils, as measured by laboratory tests, has been overemphasized, because oils in service only retain their original properties for a comparatively short period of time. Consequently the major problem is not one of selection but rather one of maintaining the oil in the desired condition.

An extensive bibliography is included.

Farm enterprise mechanics, G. A. SCHMIDT, G. F. HENRY, M. HENDERSON, F. J. ZINK, J. D. LONG, L. R. LARSON, R. H. SMITH, E. R. BRISTOL, H. O. SAMPSON, and F. C. LEWIS, edited by K. C. DAVIS (*Chicago: J. B. Lippincott Co., 1935, pp. [IX]+408, [figs. 602]*).—This is a practical treatise on construction, care, and repair of farm equipment.

The farmer's shop book, L. M. ROEHL (*Milwaukee: Bruce Pub. Co., [1936, 5. ed.], enl. and rev., pp. 471, [pl. 1], figs. 247*).—This is an enlarged revised edition of this practical treatise (E. S. R., 56, p. 283).

Farm machinery and equipment, H. P. SMITH (*New York and London: McGraw-Hill Book Co., 1937, 2. ed., pp. XIII+460, figs. 700*).—This is the second edition of this book (E. S. R., 62, p. 382), in which the greater portion of the text has been revised and rewritten to take full account of the many developments in farm machinery during the past 7 yr., particularly in tractor-drawn implements. New chapters have been added, discussing farm machinery in its relation to agriculture, dusting and spraying equipment, and terracing machinery. The chapters on wagons and motor trucks have been combined and supplemented with a treatment of the automobile trailer. Many of the illustrations have been replaced by either new or improved ones, to show the latest types of machines now available.

The discussion of the developments on the mechanical harvesting of cotton has been brought up to date, giving results of experimental work done during the past few years, especially at the Texas Experiment Station. Improvements in haying machinery, such as placing the gears in a bath of oil enclosed in a dust-proof case and the windrow pick-up baler, are described and illustrated. A number of illustrations show machinery equipped with rubber tires, an innovation on many farm implements. In general, an effort has been made to bring the entire subject matter of the text up to date and to show the latest developments in the field of farm machinery.

Studies in power farming (*Oxford: Univ. Oxford, Agr. Econ. Res. Inst., 1936, pp. 77, figs. 2*).—This contains two studies.

Part 1, Mechanized Corn-Growing, by A. Bridges and H. Whitby (pp. 7–48), deals with the organization of a number of large mechanized grain-growing farms, which were the subject of a survey made in the autumn of 1934. As a survey of the same farms, and some additional farms which properly come within the definition of mechanized grain-growing farms, is now being repeated, this report is in the nature of a preliminary statement, confined mainly to an account of the facts relating to the organization for production of the farms in question. The report is concerned with 28 English farms where the combine harvester-thresher was in use during the grain harvest of 1934.

In part 2, The Cost of Tractor Work, by J. R. Lee (pp. 49–77), an economic analysis of the situation is presented.

Utilization of tractors and cost of tractor power on grain farms (northern Great Plains and Pacific Northwest, 1933), R. S. WASHBURN and R. S. KIFER (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. [2]+31, fig. 1*).—The purpose of this mimeographed report is to show the extent to which tractors are used for farm power, the type and size of tractors in use, the kinds of work done, and the cost of using tractors on representative farms in the grain-producing

sections of the northern Great Plains and of the Pacific Northwest. The study was made in April, May, and June, 1934, and for the most part applies to the crop year 1933. The field data were obtained by personal interviews with 1,674 farm operators.

It was found that for the ordinary high-wheel tractor in the northern Great Plains, fuel and lubricants constituted 44.3 percent of the total annual cost of operating tractors, cash repairs 10.4, hired labor on repairs 0.1, other labor 1.7, depreciation 33.3, and interest 10.2 percent. In the Pacific Northwest, the percentage distribution of the total cost for track-laying tractors was as follows: Fuel and lubricants 47.3 percent, cash repairs 11.1, hired labor 0.3, other labor 1.5, depreciation 30.4, and interest 9.4 percent.

In the northern Great Plains the work of general-purpose tractors amounted to an average of 458 hr. per tractor per year, for ordinary high-wheel tractors 392 hr., and for track-laying tractors 760 hr. The greater annual use of the general-purpose tractor as compared with the ordinary high-wheel tractor was mainly accounted for by its use in cultivating row crops. The large number of days of annual use of the track-laying tractor was mainly because of the fact that this type of tractor was used almost exclusively on farms of the largest crop acreages. In the Pacific Northwest the work of ordinary high-wheel tractors and of track-laying tractors amounted to an average of 373 and 657 hr. per tractor per year, respectively. As in the northern Great Plains, the lesser amount of work done annually with high-wheel tractors than with track-laying tractors was largely because of the fact that the high-wheel tractor was used principally on the small- to medium-sized farms.

The distribution of tractors of different types and sizes in the northern Great Plains by hours used annually shows that 71 percent were used 500 hr. or less and 19 percent from 501 to 750 hr., whereas only 10 percent were used over 750 hr. In the Pacific Northwest 58 percent of the high-wheel tractors were used 400 hr. or less, 37 percent from 401 to 800 hr., and only 5 percent more than 800 hr. annually. Thirty-one percent of the track-laying tractors were used 400 hr. or less, 43 percent from 401 to 800 hr., and 26 percent more than 800 hr. annually.

Utilization of combined harvester-threshers and cost of harvesting small grains with a combine (northern Great Plains and Pacific Northwest, 1933), R. S. Washburn (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. [2]+29, fig. 1*).—The purpose of this mimeographed report is to show the extent to which combines are used, the size of combines, the kinds of grains harvested, and what present owners and prospective purchasers of combined harvester-threshers can reasonably expect in the way of costs of using combines in grain-producing areas of the northern Great Plains and of the Pacific Northwest. The study was made in April, May, and June, 1934, and for the most part applies to the crop year 1933. The field data were obtained by personal interviews with 1,674 farm operators.

The data show that combines in the northern Great Plains were used an average of 152 hr. annually, of which 146 were for home work and 6 were for custom work. The work of combines in all areas was principally that of harvesting and threshing wheat. Combines in the Pacific Northwest were used an average of 186 hr. annually, of which 172 were for home work and 14 were for custom work. The work of combines in these areas was almost entirely that of harvesting and threshing wheat. Of an average of 515 acres of grain cut per combine per year for combines of all sizes, 474 acres were cut on the home farm, of which 456 acres were wheat.

In the northern Great Plains, 68 percent of the 12-ft. combines cut 400 or fewer acres annually, whereas 61 percent of the 16-ft. combines cut over 400 acres annually. For combines of all sizes, 37 percent cut 300 or fewer acres, 46 percent cut from 301 to 700 acres, and 17 percent cut over 700 acres annually. In the Pacific Northwest, 75 percent of the 12-ft. combines cut 400 or less acres annually, whereas 69 percent of the 16-ft. machines cut over 400 acres annually. For all combines represented, 29 percent cut 300 or fewer acres, 54 percent cut from 301 to 800 acres, and only 17 percent cut over 800 acres annually.

For the northern Great Plains, fuel and lubricants constituted 15.1 percent; cash repairs, 15.9; owner and family labor on repairs, 2.0; hired labor, 0.4; depreciation, 51.6; and interest, 15.0 percent of the total annual cost of operating combines. For the Pacific Northwest, the percentage distribution was fuel and lubricants, 14.3 percent; cash repairs, 24.0; owner and family labor, 2.9; hired labor, 1.2; depreciation, 41.4; and interest, 16.2 percent.

Effect of tractor tire size on drawbar pull and travel reduction, L. W. Hurlbut and C. W. Smith (*Agr. Engin., 18 (1937), No. 2, pp. 53–57, figs. 23*).—Further studies conducted at the Nebraska Experiment Station are reported (E. S. R., 75, p. 406), using footings of fine sand and wild hay meadow stubble on a loamy fine sand. The equipment used in making the test was the same as used the preceding year and consisted of five sizes of pneumatic tractor tires, as follows: 9.00×24, 9.00×36, 11.25×24, 12.75×24, and 13.50×24, and a set of steel wheels and lugs. A Douglas truck was the foundation of the drawbar loading unit. The object of the tests was to get more information on the effect of tire cross section on the drawbar pull of a tractor, and the rear weight of the tractor was kept constant at 2,780 lb. Third gear was used for all tests.

A group of charts is presented comparing the drawbar pull of each tire when carrying 8 lb. and 16 lb. of air pressure, for both the cornfield and the hay stubble. The 8-lb. inflation pressure gave the greater traction for both footings and for all tires.

Another group of charts is presented comparing all tires in drawbar pull, first at 8-lb. inflation pressure and then at 16-lb., both for the field and stubble. A curve for steel wheels was plotted with the rubber tire data, and for the cornfield the steel wheel was better than rubber with 16-lb. inflation pressure but not so good as the rubber with 8-lb. pressure.

The 9.00 × 36 tire stood out as the best under most circumstances. No great difference could be observed in the tractive ability of the others. Once the load became too heavy to be pulled in the sand, the tires with the smaller cross sections would tend to dig in and bury themselves much more rapidly than those with larger cross sections.

A third set of charts compared the delivered horsepower of all tires, first using 8-lb., then 16-lb. inflation pressure. The tires giving the largest effective wheel diameters gave the greatest horsepower. With the drawbar pull approximately the same, the horsepower varied as the rate of travel. The drawbar pull with 16-lb. inflation pressure was so much below that for 8-lb. that the delivered horsepower at 8-lb. exceeded that at 16-lb. definitely.

Two charts compared the drawbar pulls with tire cross section. In the chart for the cornfield there seemed to be a slight tendency for a small increase in drawbar pull with tire cross section, but in the chart for the hay stubble the curves indicate no difference in traction due to tire cross section.

Two charts comparing the effective wheel diameters with drawbar pulls showed a slight advantage for the larger diameter tires. The hay stubble proved to be the best traction surface thus far encountered.

Tillage, planting, and harvesting equipment on grain farms and rates of doing field work with these implements when drawn with horse and with tractor power (northern Great Plains and Pacific Northwest), R. S. WASHBURN and D. MERRICK (*U. S. Dept. Agr., Bur. Agr. Econ., 1936, pp. [2]+51, fig. 1*).—This mimeographed report presents information relative to kind, size, and accomplishment of field implements on representative grain farms. The first part of the report gives numbers and sizes of field implements by type-of-farming areas. The second part shows the rates at which these implements did field work when drawn with horses and with tractors. The study was made in April, May, and June, 1934, and for the most part applies to the crop year 1933. The field data were obtained by personal interviews with 1,674 farm operators in grain-producing areas of the northern Great Plains and the Pacific Northwest.

Tests of tillage tools.—I, Equipment and procedure for moldboard plows, I. F. REED (*Agr Engin., 18 (1937), No. 3, pp. 111–115, figs. 11*).—Methods, equipment, and studies being conducted at the Alabama Experiment Station in cooperation with the U. S. D. A. Bureau of Agricultural Engineering are described.

Load studies on tillage tools, A. W. CLYDE (*Agr. Engin., 18 (1937), No. 3, pp. 117–121, figs. 9*).—Studies continued at the Pennsylvania Experiment Station (E. S. R., 74, p. 706) are reported. Tools studied included moldboard plows of speed type and of conventional shape at 2.5 and 4.5 m. p. h.; moldboard plows with rolling colter, and combined colter and jointer, in moist and dry sod; moldboard plow with U. S. D. A. self-aligning disk jointer, in moist and dry sod; disk plow, 24 in.; and disk harrow, 18 in.

It was found that the useful soil force on plows and disks is usually made up of nonconcurrent parts. They can be combined into two nonconcurrent forces, or into a resultant force and a couple, as desired. Information as to particular tools under certain conditions is given. The speed-type moldboard plow required less draft at both 2.5 and 4.5 m. p. h. than the one of conventional shape. At the higher speed the speed-type bottom did a better job of covering.

The U. S. D. A. self-aligning disk jointer in heavy plowing gave a substantial reduction in total draft, but an increase in side force, as compared with colter and jointer equipment. In 7-in. plowing with the disk set 2 in. over the point, the disk used over 40 percent of the draft, leaving less than 60 percent for the plow. The self-aligning feature protected it from damage by stones.

Examples are given of using soil force measurements for computing bearing loads on the disk jointer and disk plow. Wide spacing of bearings reduces the loads because of the overhanging nature of the forces. The conclusion is drawn that the commonly used center-of-resistance rule for plow hitches is wrong, because it takes no account of the weight of the tool nor of varying soil forces. Suggestions are given for a rule which will be of more universal application.

The small combine harvester thresher, E. C. SAUVE (*Michigan Sta. Quart. Bul., 19 (1937), No. 3, pp. 162–164, fig. 1*).—The results of the survey of the use of the combine harvester-thresher by Michigan farmers are briefly presented, indicating that 5- or 6-ft. combines, reasonably priced, will give satisfaction and economy.

Electric soil heating for hotbeds, T. E. HIENTON and J. H. MACGILLIVRAY (*Indiana Sta. Circ. 226 (1936), pp. 16, figs. 9*).—The results of studies are briefly reported which showed that the use of soil-heating cable for heating hotbeds

electrically is superior to the individual heater from the standpoint of ease and cost of installation and cost of operation. Cabbage and tomato plants will germinate in less time and the plants grow faster in hotbeds with the cable installed on the surface of the soil, or in the soil and air, or at a depth of 3 in. in the soil than in those where the cable is 6 in. below the soil surface. Records of 35 electrical hotbeds operated in the State from 1931 to 1936 showed a variation in consumption from 0.22 to 3.6 kw.-hr. per 3- by 6-ft. sash per day. Of the entire group, 8 used less than 1 kw.-hr. per sash per day, 12 used from 1 to 1.5, 7 used from 1.5 to 2, 4 used from 2 to 3, and 4 used more than 3 kw.-hr. Covering hotbeds at night reduced the amount of energy consumed, and the use of cinder insulation under and around the beds showed a saving of 20 percent in amount of electricity used. Banking the frames with soil and fitting sash tightly to the frames likewise reduced energy consumption. Control of heating units with thermostats showed no advantage in saving of electric energy over manual control, but eliminated the necessity for close personal attention to temperature regulation.

Electrification of a fruit farm, T. E. Hienton (*Agr. Engin.*, *18* (*1937*), *No. 2*, *pp. 68–70*, *figs. 4*).—In a brief contribution from the Indiana Experiment Station uses of electricity for operating water pumps, spray plants, fruit washers, fruit sizers, cider presses, and fans and refrigerators in fruit storages and for other purposes are described.

Losses of organic substance in the spontaneous heating of alfalfa hay, E. J. Hoffman and M. A. Bradshaw (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 3*, *pp. 159–184*).—In a series of 7 large-scale storage experiments conducted by the U. S. D. A. Bureau of Chemistry and Soils, of which 6 were with alfalfa hay and 1 with clover, the extent of the losses of the organic substance of hay resulting from spontaneous heating was determined, and in 4 of these the nature of the losses was investigated. The length of storage in these experiments ranged from 1 to 7.5 mo. The samples of hay investigated contained moisture ranging from approximately 28 to 70 percent. The moisture content of the hay immediately surrounding the samples in the mows was between the limits of approximately 10 and 60 percent, while the average moisture content of the mows ranged from 18 to 35 percent.

The greatest losses in organic substance as determined by loss in weight occurred in those experiments in which hay of very high moisture content was stored in a mow whose average moisture was also high. In these experiments the maximum loss was approximately 22 percent, the minimum 4, and the average nearly 13 percent. Losses in the individual samples varied with the respective conditions and surroundings in which these were located in the mows, particularly with respect to the free passage of air.

The losses in organic substance were much less when the hay samples approximated normally cured hay in moisture content and were stored in a mow of much lower moisture content. Here the maximum loss was 8 percent and the average about 6 percent. When a relatively small proportion of the mow was of high moisture content while the remainder was very dry, the losses were also comparatively small for samples of high moisture content, the maximum loss being 8.6 percent and the average loss less than 3.5 percent.

The greatest losses of organic substance occurred in experiments in which the moisture conditions were favorable to heat production and in which the highest temperatures were recorded.

The results of the investigation demonstrate the seriousness of the losses in the value of hay resulting from the spontaneous heating of undercured hay. They show further that loss in weight alone of organic substance does not indi-

cate fully the extent of loss in value, as evidenced by the fact that most of the undercured hay of those mows in which the maximum loss was 22 percent had deteriorated into hay of very inferior quality.

The one experiment designed to show the effect of salting upon spontaneous heating failed to show any material difference in hay substance loss due to the use of approximately 1.5 percent of salt.

Investigation showed that the losses of organic substance incurred under these storage conditions involved definitely and chiefly the fats, the sugars, and the hemicellulose group. Where the extent of losses was greatest, cellulose and crude protein also had been attacked. Lignin apparently suffered no loss.

Treatment of milk wastes: American and European practice, A. M. Buswell (*Milk Plant Mo., 26 (1937), No. 1, pp. 28–30, fig. 1*).—This contribution from the University of Illinois presents a technical discussion of the treatment of milk wastes.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Illinois Station, 1934–35] (*Illinois Sta. Rpt. 1935, pp. 183–219, figs. 4*).—Results of investigations not previously noted are reported as follows: Tables by H. C. M. Case, M. L. Mosher, J. B. Andrews, J. B. Cunningham, and W. A. Herrington showing the variations in earnings and the causes therefor on farms in 8 counties; tables by P. E. Johnston, Case, Andrews, E. L. Sauer, and T. R. Hedges showing averages by counties or groups of counties for capital investment, receipts, expenses, etc., in 1934 on 1,548 farms; findings in the survey in 1934 by Case and G. L. Jordan of the long-time and production credit used by 77 farm operators; tables by R. C. Ross, Case, Sauer, and E. B. Colegrove showing the yields and net costs per bushel and net profit per acre of different crops, costs and profits for different kinds of livestock, and costs of horse and tractor power on Champaign and Piatt County farms in 1932, 1933, and 1934; a table by Johnston and J. E. Wills showing the average costs, 1930–33, for man labor, horse work, and machinery on 5,220 central Illinois farms grouped by number of crop acres per farm; findings by C. L. Stewart in studies of farm real estate, taxes and tax delinquency, land values, land transfers, and the relation between tenancy and land values; tables by Case, Sauer, and L. E. Card showing the average investment, receipts, expenses, and earnings of poultry enterprises on 37 farms and the cost of producing pullets to laying age in 1934, and the 12 most profitable and 12 least profitable farms; findings as to yields, costs, and net income in 1934 on 25 fruit and 8 vegetable farms, studied by Johnston and V. W. Kelley; findings in a study by J. W. Lloyd as to possible ways of reducing costs in peach packing, and by Lloyd and S. W. Decker as to the reduction of deterioration of peaches by proper refrigeration; and findings by Jordan of the effects on soybean prices in Illinois of the United States production, weekly earnings of New York factory workers, and corn production in the United States.

[Investigations in farm management by the Indiana Station] (*Indiana Sta. Rpt. 1936, pp. 41–44, figs. 2*).—Brief summarizations are included of studies on pasture uses in southern Indiana; profitable farm practices; small combine harvester-thresher; farm machinery and farm power costs; adequacy of farm buildings; costs and practices with tomatoes, onions, and other intensive crops; relationship of farm tenure to profitable farming; part-time farming; basic information for agricultural adjustments; and patronage relationships of local grain elevators.

[Papers on agricultural economics] (*Sci. Agr., 17 (1936), No. 2, pp. 74–85, 92–97, 100–103*).—Included are the following: Beef Cattle Production—a Problem, by G. B. Rothwell (pp. 74–82); The Horse Breeding Situation in Canada, by J. A. Ste. Marie (pp. 83–85); Marketing Legislation in New Zealand, by C. V. Parker (pp. 92–94); Objectives in the Alberta Land Utilization Survey, by G. H. Craig (pp. 94, 95); Some Data on the Consumption of Maple Products, by G. P. Boucher (pp. 96, 97); and Life Insurance Carried by Farmers in the Lomond and Vulcan Districts, Alberta, by W. J. Hansen and J. Proskie (pp. 100–103).

The recovery problem in the United States (*Washington, D. C.: Brookings Inst., 1936, pp. XIV+709, [pls. 5, figs. 62]*).—Part 1, the sweep of world events, reviews the international setting of the depression in the United States in chapters covering the background, course, and world impact of the depression, and the extent and character of and government policies in relation to recovery. Part 2, readjustments in the United States, is a more detailed study of the course of the depression and recovery in the United States in chapters on employment and unemployment, production and productivity, accumulated needs in durable goods, reemployment possibilities, wage readjustments, changes in the price structure, the trend of government finance, readjustments of private debt, interest rates and the availability of credit, trends in international trade and financial relations, and changes in monetary relations. Part 3, readjustments required for recovery, includes chapters on the recovery program of the United States Government, government credit and general financial stability, international economic policies, and wage and price policies. Appendixes include statistics relative to world trends, brief summaries of legislation in 14 countries during the depression, data relating to employment, production, wages, durable goods, prices, public finance, private debts and interest payments, and international trade and finance.

Agrarian problems in southernmost China, CHEN HAN-SENG (*Shanghai: Kelly & Walsh, 1936, pp. VIII+144*).—This study "limits itself in the main to a presentation of the facts and attempts to give a rounded and realistic account of the most important elements in the problem situation without, on the one hand, tracing these all the way to their historical sources or, on the other, drawing all the conclusions about the nature and probable trends of their respective effects which it would be possible to deduct." The chapters deal with distribution of land ownership and use; the economic and political position of the collective landlords; the system of tenancy; the rent and price of land; taxes, tolls, and torts; trade and credit; and the decline of wages and the loss of labor power.

Supplementary report of the Land Planning Committee to the National Resources Board, I–X (*Washington: Govt., 1936, pt. 1, pp. V+47, figs. 37; 1935, pts. 2, pp. V+114, figs. 13; 3, pp. V+64, figs. 23, [maps 2]; 1936, pt. 4, pp. V+51, figs. 2, [maps 2]; 1935, pts. 5, pp. V+112, [pls. 5], figs. [18], [map 1]; 6, pp. V+55, figs. 7, [map 1]; 7, pp. V+139, [pl. 1], figs. [9]; 8, pp VII+114, [pls. 4], figs. 58; 9, pp. V+24, figs. 2; 10, pp. V+73, figs. 11*).—The following are supplementary reports to that previously noted (E. S. R., 73, p. 403):

Part 1, general conditions and tendencies influencing the Nation's land requirements, deals with the outlook for population, basic industrial conditions, and the relation of mechanical progress in agriculture to land utilization and land policy. Part 2, agricultural exports in relation to land policy, deals with the general considerations relating to agricultural exports, international payments in relation to such exports, the probable development of population in foreign countries and its significance for agricultural exports, the prospective

world wheat situation in relation to American exports, and the prospective foreign demands for American cotton, tobacco, and fruit. Part 3, agricultural land requirements and resources, deals with the per capita consumption of farm products, yield factors in cropland requirements, prospective acreage requirements for crops and for pasture, trends in area and productivity of range lands and land available for range, prospective modification and trends in crop acreage harvested in the various regions of the United States, and classification of land relative to productivity. Part 4, land available for agriculture through reclamation, includes sections on the extent of land use under irrigation, relation of drainage to land use policies, and farm land available through clearing. Part 5, soil erosion—a critical problem in American agriculture—deals with the crisis in land utilization, the process and effects of soil erosion, national erosion reconnaissance, erosion conditions in the United States, erosion control demonstration on a national scale, a national policy of erosion control, the future of erosion control, erosion conditions by States, engineering aspects of erosion control, and farm organization and related facts for selected areas in erosive regions. Part 6, maladjustments in land use in the United States, deals with the desirable major land use adjustments and their regional distribution, conditions of areas in which farm retirement is proposed, the program for retirement of poor farm land, drought frequency, and rural-urban migration in relation to land quality. Part 7, certain aspects of land problems and Government land policies, includes sections on the problems of range lands, farm tenancy in the United States, a program for chronically tax delinquent and tax reverted land, policies with reference to adjustments in local government and finance, recent land policies of the Federal Government, a summary of the status of Federal and State lands, development of a unified land program, land use planning and production control, public policies for facilitating land settlement, and other measures for discouraging settlement on poor lands. Part 8, forest land resources, requirements, problems, and policy, deals with the general concepts of requirements of forests and forest products, a study of timber consumption and requirements, forest land area and its management in relation to the Nation's requirements, other values of forests, land available for forests, progress in forestry and major problems, present and recommended ownership of forest land, areas that should continue in private ownership, measures needed to safeguard the public interest in private forests and to aid private forestry, areas recommended for ultimate public ownership, administration and development of public forest holdings, program for the protection of public and private forest lands, Federal and State aid for protection and development, and forest research and extension. Part 9, planning for wildlife in the United States, covers sections on the requirements for wildlife areas, policies with respect to wildlife, and wildlife management in national forests. Part 10, Indian land tenure, economic status, and population trends, includes sections on the complexities of Indian land tenure arising from the allotment system, social and economic survey of selected Indian reservations, agricultural credit needs of the Indians, and the trend of Indian population.

State planning; A review of activities and progress, National Resources Board, June 1935 (*Washington: Govt., 1935, pp. XIII+310, [figs. 117]*).—This publication of the National Resources Board is a review of the activities and progress of State planning boards.

Research program in relation to economic planning for agriculture, C. O. Brannen (*Southwest. Social Sci. Quart., 17 (1936), No. 3, pp. 281–289*).—This is a brief discussion of the method of approach in a research program and the information needed in economic planning for agriculture.

First report on State policies, S. R. DE BOER (*Salt Lake City: Utah State Planning Bd., 1935, pp. [13]+159+[6]*).—This first report of the Utah State Planning Board includes an outline of the principles and procedure adopted by the board and the following reports: Policy planning for Utah, land use policies, water resources policies, mineral resources policies, power resources policies, scenic resources policies, and population policies.

Planning and political geography, W. H. MILLER (*Jour. Land and Pub. Util. Econ., 12 (1936), No. 4, pp. 422–426, fig. 1*).—Six general guiding principles are set out for the division of a State into counties, and suggested plans for dividing California into 5 and 14 counties are discussed briefly.

Geography and the relief problem in Texas and Oklahoma, M. F. BURRILL (*Southwest. Social Sci. Quart., 17 (1936), No. 3, pp. 294–302*).—This is a brief discussion of the relation of the geography of these States to the relief program.

Iowa income, 1909–1934 (*Iowa City: State Univ. Iowa, Bur. Business Res., 1935, pp. 122, [figs.] 22*).—"This study of Iowa income was undertaken and carried to completion under the auspices of the population and social trends committee of the Iowa State Planning Board. Its primary objectives, as a planning project, were (1) to determine the amount and the trend of income available to the people of the State, to provide a basis for estimating economic welfare and progress; (2) to analyze the composition of the State's economic structure by showing the relative importance of the various industries; and (3) to indicate the direction in which the economic life of the State is moving."

The income of the counties of Iowa (*[Ames]: Iowa State Planning Bd., [1935], pp. [2]+32, [pls. 4]*).—This bulletin supplements that noted above. Tables and maps show by counties the average, total, and per capita incomes for the periods 1927–29 and 1931–33 from different industries, and the percentage distribution between counties of the total income from each industry.

A series of industrial studies for Utah, 1935, D. C. HOUSTON and R. M. HILL (*Salt Lake City: Utah State Planning Bd., 1936, pp. [8]+106+[2], figs. 24*).—Included are reports on employment, wealth, and income in Utah; the decline of Utah's manufacturing industries; agricultural cooperation in Utah; Utah's important out-of-State markets for products of agriculture; cooperative marketing among Utah poultrymen; Utah's dairy industry; marketing methods and practices among Utah honey producers; commercial traffic by automotive truck through Santa Clara; and miscellaneous studies.

Township organization in Missouri, W. L. BRADSHAW and M. GARRISON (*Missouri Univ. Studies, 11 (1936), No. 4, pp. 70, fig. 1*).—This study deals principally with the optional system of township government existing in 24 counties of the State. It includes chapters on the history of townships in Missouri, nature of township organization, taxation and financial administration, and township roads and bridges.

Agricultural labor problems in Arkansas (*Ark. State Policy Com., Pub. Paper No. 1 (1936), pp. [3]+34, figs. 4*).—This is a report on farm tenancy in Arkansas prepared by a subcommittee of the Arkansas State Policy Committee.

A report on the rehabilitation of the dry areas of Alberta and crop insurance, 1935–1936 (*Edmonton, Alta.: Min. Agr., 1936, pp. 80, figs. [6]*).—This is a report of the committee appointed by the Minister of Agriculture to investigate and report upon the problems in the drought area of Alberta, including the causes and methods of control of soil drifting, farm management practices and livestock policy, conservation of feed and water supplies, educational and demonstrational programs, and crop insurance.

The mechanisation of agriculture in Latvia, V. Kunkis (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 27 (1936), No. 9, pp 293–306*).—Mechanization as a fundamental problem of the agriculture of Latvia and the Government measures to encourage it are discussed.

Land settlement: A report prepared for the Carnegie United Kingdom Trustees, A. W. Menzies-Kitchin (*Edinburgh: T. & A. Constable, 1935, pp. XVI+175, [pls. 2, fig. 1]*).—This report is based upon studies of inquiries in Great Britain and data collected in Germany, Denmark, and the Netherlands, and was made from the standpoint of land settlement as a social problem rather than as a relief for unemployment. The several chapters deal with general and economic conditions, legislation in Great Britain, Germany, Denmark, and the Netherlands, small holdings and the economics thereof, vegetable, pig, and poultry production, the organization of land settlement, and subsistence holdings in Great Britain, Germany, and the United States.

Report on the work of the Land Division of the Ministry [Great Britain] for the year 1935, D. B. Toye (*[Gt. Brit.] Min. Agr. and Fisheries, Land Div. Rpt., 1935, pp. IV+65*).—The work of the division under the several acts administered by it is summarized.

Land settlement in Germany, C. Turnor (*London: P. S. King & Son, 1935, pp. 30, [pl. 1, figs. 6]*).—The types of settlement and operation of the settlement system in Germany are described and compared with those in England.

Changes in farms and farm tenure, 1930–1935, G. S. Wehrwein (*Jour. Land and Pub. Util. Econ., 12 (1936), No. 2, pp. 200–205, fig. 1*).—A map shows by States the percentages of tenancy in 1930 and 1935. The changes are discussed, and a table is included showing for 1925, 1930, and 1935 the number of States in which the number of farms, owner farms, and tenant farms all increased or decreased, and the number of owner farms and the number of tenant farms which increased or decreased when the other type of farms or all farms increased or decreased.

Farm organization and soil management practices in four Ohio areas, F. L. Morison and J. I. Falconer (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 97 (1937), pp. [1]+17*).—Included are preliminary data released for use in a county agricultural planning project conducted in cooperation with the U. S. D. A. Bureau of Agricultural Economics and Soil Conservation Service. Tables show for the period 1933–36 for each of 4 areas, including 86 farms in Ashtabula County, 80 in Wyandot County, 76 in Wood County, and 33 River Valley farms in Pike County—areas typical of larger sections in their respective parts of the State—the crop yield index, percentages of rotated area in different crops, percentages of hay acreage in different hays, amounts of fertilizer and lime used per 100 rotated acres, tenure and size of farms, yields of chief crops, animal units per farm and per 100 rotated acres, and labor income, 1935, per farm and per rotated acre. In making the analysis the farms are divided into 5 groups each on the basis of annual soil productivity and crop index (except Pike County). Groupings on the basis of size of farm were also made in Wyandot and Wood Counties and in number of rotated acres in Pike County.

A survey of small farming in Hawaii, F. E. Armstrong (*Hawaii Univ., Res. Pubs. No. 14 (1937), pp. 90*).—Some of the characteristics of the farms and their operators; the tools, equipment, and conveniences; livestock, field crop, fruit, nut, and vegetable production on such farms; and the income and supplementary occupations of the operators are discussed.

The social income and family farm earnings of farm from 1927–28 to 1931–32, J. Deslarzes (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 27 (1936), No. 4, pp. 122–133*).—A table is included showing, by general averages for 1927–30, 1930–31, and 1931–32, and for 1931–32 by farms grouped

by size, area, or type of enterprise, the income passing to third parties (taxes, interest, and wages) and returns to operators in Denmark, Switzerland, Austria, Latvia, Estonia, Lithuania, Poland, Norway, Finland, Sweden, Germany, the Netherlands, etc.

Social income of farms in three States of the United States of America (Illinois, Iowa, Indiana) in 1932–33, J. DESLARZES (*[Internatl. Rev. Agr.], Mo. Bul. Agr. Econ. and Sociol. [Roma], 27 (1936), No. 7, pp. 203–216*).—This is a study similar to that previously noted.

The home production of food supplies (*Tennessee Sta. Rpt. 1936, pp. 4–6*).—Results of the first season's work on a resettlement project near Crossville, on the Cumberland Plateau, are briefly noted.

Home-grown farm produce used by the farm household, E. B. HILL (*Michigan Sta. Quart. Bul., 19 (1937), No. 3, pp. 165–168*).—Records were obtained for 1935 from 113 farms in southern Michigan, 41 in northern Michigan, and 9 in the Upper Peninsula. Tables show for each group of farms the average amounts and values of different products used in the home and the number of farms using each product. The average values of products used, excluding rent of house, were southern Michigan $276.45, northern Michigan $317.36, and Upper Peninsula $286.22.

[Papers on marketing agricultural products] (*Jour. Marketing, 1 (1936), Nos. 1, pp. 3–12, 35–39; 2, pp. 115–128, 143–149, fig. 1*).—Articles on the marketing of farm products are included as follows: The Consumer and the Agricultural Adjustment Administration, by D. S. Anderson (pp. 3–9), with comments by E. A. Duddy (pp. 9–12); Market Research in Germany, by K. Brandt (pp. 35–39); Economic Provisions of Marketing Agreements for General Crops, by B. A. Holt (pp. 115–126), with comments by J. E. Boyle (pp. 127, 128); and Seasonal Storage [of Wheat] in China, by W. M. Stevens (pp. 143–149).

The Agricultural Marketing Acts, H. M. CONACHER (*Edinburgh: W. Green & Son, 1935, pp. VIII+192*).—The texts of the Agricultural Marketing Acts of 1931 and 1933 of the British Parliament, the regulations under the legislation, and explanations and commentaries are included. Appendixes list the statutory rules and orders and the orders made by the Board of Trade, the Scottish and English milk marketing schemes, and the hops, pigs and bacon, and potato marketing schemes, and section 12 of the Milk Act of 1934.

Maize, G. H. FERGUSON ET AL. (*[Gt. Brit.] Imp. Econ. Com. Rpt., 28 (1934), pp. 60, fig. 1*).—This report of the Imperial Economic Committee on the preparing for market and marketing of maize discusses the world production and trade, principal producing areas of the British Empire, the demand for maize and maize products in the United Kingdom and the Irish Free State, types and uses of maize in agriculture and manufacturing, marketing, wholesale prices, the possibilities of extending the market for Empire maize, and the outlook.

Marketing Michigan's tablestock rutabagas, B. R. CHURCHILL (*Michigan Sta. Quart. Bul., 19 (1937), No. 3, pp. 168–172, figs. 2*).—The available markets, market demands, grading, and qualities preferred by producers are described.

Some statistical aspects of future trading on a commodity exchange, G. R. WHITE (*Jour. Roy. Statis. Soc., n. ser., 99 (1936), No. 2, pp. 297–342, pl. 1*).—This is a study of the trading on the New York Hide Exchange from its beginning on June 4, 1929, through December 1935, to ascertain whether future trading has been of any benefit to the trade. "The analysis has shown (1) there is no evidence that the introduction of future trading in America has had any damping effect on hide price fluctuations, in fact, the evidence tends to point in the opposite direction, and (2) hedging has only provided imperfect price insurance, in some cases the operator making unexpected profits and in others

heavy losses." The investigations also showed that an alternative method of *price insurance—an international insurance company*—has possibilities that justify attention. Several short discussions follow the paper.

Cotton futures, H. Braun (*Das Baumwollterminegeschäft. Stuttgart: C. E. Poeschel, 1936, pp. XI+224* [*pls. 14, figs. 11*]).—This is a study of the elimination of price risks by cotton futures in the cotton trade of North America, with special reference to the German cotton and ready-made goods industries.

Cooperative consumer credit, with special reference to credit unions, M. R. Neifeld (*New York and London: Harper & Bros., 1936, pp. X+223*).—The development, present status, and different types of credit unions are described. The strong and weak points of such unions are discussed, and a "27-point program" for such unions is presented. Appendixes include the uniform credit union law drafted by the Credit Union National Extension Bureau, the Federal Credit Union Act, a brief digest of State credit union laws, a suggested form for the annual report of credit unions, and a bibliography.

Co-operative insurance, N. Barou (*London: P. S. King & Son, 1936, pp. XIII+391*).—"The object of this book is to outline the theory and practice of cooperative and mutual insurance throughout the world." The 12 chapters cover insurance (nature and elements), shortcomings of popular insurance, mutual insurance, cooperative insurance, consumers' cooperative insurance societies, cooperative labor insurance institutions, agricultural cooperative insurance (general societies) agricultural cooperative insurance (special societies), cooperative employees' insurance societies, organization, funds and their investment, and conclusions.

"Popular insurance, though of the greatest importance for the working population, is not covered sufficiently by social insurance and is not served satisfactorily by profit-making insurance companies. Because of this, wage earners and small farmers have been constrained to form their own insurance societies on nonprofit-making cooperative lines. The movement has been spreading rapidly during the last 70 yr., and it now comprises over 20 millions of members and has accumulated funds amounting to 1,000 million pounds. It must be made clear at the outset of this study that cooperative insurance can only supplement, but not replace or eliminate, social insurance. Present-day wages do not leave a sufficient margin for the wage earner to cover all his insurance needs, and the State must take care of a part of them."

Index numbers of prices and purchasing power of farm products in Norway, P. Borgedal (*Meld. Norges Landbr. Høiskole, 16 (1936), No. 7, pp. 531–546, fig. 1*).—Tables are included and discussed showing by months, April 1933–March 1936, the prices of different farm products and materials; the index numbers (1909–14=100) of grains, potatoes, hay, milk, meat animals, plant products, animal products, fertilizers, concentrates, building materials, machinery and equipment, freight rates, commodities bought for living and for use in production, and wages; and the purchasing power of farm products in commodities for production and living and wages, of milk, meat, pork, and eggs in concentrated feeds, and of plant, animal, and all farm products in fertilizers. Monthly indexes of the price of all farm products (1913–14=100) are also included.

International yearbook of forestry statistics, 1933–35.—I, Europe and U. S. S. R. (*Internatl. Inst. Agr.* [*Roma*], *Internatl. Yearbook Forestry Statis., 1933–35, vol. 1, pp. XII+327*).—Included are a summary and detailed tables relating to forests and the trade in lumber covering practically the whole of Europe and the Union of Soviet Socialist Republics.

RURAL SOCIOLOGY

A study of relief activities in seven Nebraska counties, 1927–1934, L. H. Stott (*Nebraska Sta. Res. Bul. 89 (1937), pp. 24*).—This investigation of the relief situation in Nebraska was undertaken (1) to determine how public relief funds were administered in the various counties of the State before the beginning of Federal participation, (2) to determine the amounts of goods distributed as part of the relief activities, and (3) to show the extent to which relief was extended to families actually engaged in farming. The data were obtained in two surveys, one in the spring of 1933 when information over a period of years was obtained and the other in the summer of 1934 covering the 6 mo. from July 1933 to January 1934. Information is presented for each of seven counties, together with a description of the type of farming and the general policy of relief administration during the period, with tabulated summaries of yearly expenditures of county funds for various relief purposes for 1927–33 and the relief activities of volunteer and Federal agencies in general for 1931–33. The extent of relief in relation to the character of the population for the various counties in 1932 and 1933 is shown in a summary giving the distribution of the population for each county and the total and per capita expenditures of county relief funds for the 2 yr.

General observations are given on the attitudes of county officials and relief workers.

Rural social welfare vitally affected by land usage, D. E. Lindstrom (*Illinois Sta. Rpt. 1935, pp. 9–12, fig. 1*).—Studies conducted by the station, in cooperation with the National Resources Board, the Federal Emergency Relief Administration, the Illinois Planning Commission, and the Illinois Emergency Relief Administration, are briefly summarized.

Family life cycle analysis, C. P. Loomis and C. H. Hamilton (*Social Forces, 15 (1936), No. 2, pp. 225–231, fig. 1*).—Using data obtained in a study of 1,144 rural families in Enfield Township, Halifax County, N. C., a test analysis is made using the historical and the cross-section methods. "The comparative analysis here presented, even though supported by an insufficient number of cases, leads the authors to the conclusion that the cross-section method is useful in the analysis of family living data. In certain areas where there have been no great changes in social and biological factors affecting the family, a relatively accurate picture of the historical life cycle of the farm family may be secured by the makeshift method—the cross-section analysis."

Youth.—VI, Community surveys, C. A. Jessen and H. C. Hutchins (*U. S. Dept. Int., Off. Ed. Bul. 18 (1936), pt. 6, pp. X+97, pl. 1*).—Part 1 brings together the principal findings in 34 youth surveys in 18 States under the headings of education, employment, recreation, and subjects investigated less frequently. Part 2 analyzes and discusses the data obtained in 13 community surveys made by the Committee on Youth Problems of the U. S. Office of Education in sections on educational and employment findings and use of leisure time. Part 3 discusses the information to be gathered and the method of obtaining and analyzing such data.

Included is an annotated bibliography of the surveys considered in part 1 and the schedules used in the youth survey in the Office of Education.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Good 4-H work links with right farm attitudes, H. W. Mumford and D. E. Lindstrom (*Illinois Sta. Rpt. 1935, pp. 8, 9*).—An analysis of the effectiveness of the 4-H club program as regards attitude toward farm life is briefly noted.

FOODS—HUMAN NUTRITION

Applied dietetics: The planning and teaching of normal and therapeutic diets, F. Stern (*Baltimore: Williams & Wilkins Co., 1936, pp. XXI+263, [figs. 11]*).—This book contains materials and data organized for use in the dietetic treatment of the ambulatory patient. The subject matter presents the principles of nutrition that are used as a basis in the planning of normal and therapeutic diets; the environmental conditions that may influence the effectiveness of the diet; methods and materials helpful in the education of the patient; tables and charts to simplify dietary computation; a series of dietary outlines illustrating that the therapeutic diet is a modification of the normal diet to compensate for changes in the body caused by disease or abnormal conditions; and typical diets and menus showing the foods necessary to supply the food constituents required for the normal diet and the variations in the therapeutic diets. The material was formulated in close association with the physician and should be helpful to the dietitian, social worker, nurse, public health worker, teacher, and student in home economics.

[Food studies by the Illinois Station] (*Illinois Sta. Rpt. 1935, pp. 294–300, fig. 1*).—This progress report (E. S. R., 74, p. 566) deals with a continuation of work under the direction of S. Woodruff on new methods of making starches from corn and the properties of the gels prepared from the various starches, a comparison of wheat starches with corn and potato starches, the bread- and cake-making qualities of different grades of flour from Fulhio wheat, and the cooking quality and palatability of different varieties of soybeans of the vegetable type, both as green and as dry beans. Data are included on the proximate composition of four varieties of soybeans when green and when mature.

[Studies in foods and nutrition of the Tennessee Station], F. L. MacLeod (*Tennessee Sta. Rpt. 1936, pp. 43, 44*).—This progress report (E. S. R., 76, p. 125) includes data on the vitamin G content of canned green and white asparagus, dried leaves of *Lespedeza sericea*, green peas, green string beans, and sweetpotatoes, on the vitamin A content of the fresh and dried leaves of *L. sericea* and alfalfa, and on the utilization of dicalcium phosphate by the white rat.

[Studies in foods and nutrition of the Washington Station] (*Washington Sta. Bul. 342 (1936), pp. 40–42*).—Included in this progress report (E. S. R., 75, p. 136) are summaries of studies by E. N. Todhunter on varietal differences in the vitamin C content of apples (Golden Delicious, Rome Beauty, and Yellow Newtown) and of frozen red raspberries (Marlboro), on the relative vitamin C content of pared and unpared apples of the same varieties, and a comparison of heat-treated and alcohol-extracted casein as the source of protein in the basal vitamin A-deficient diet; by V. E. Sater on factors affecting the cost of operating domestic mechanical refrigerators, with special reference to different frozen dessert mixtures, and on time and cost evaluation of home canning; and by M. Boggs on time and cost evaluation of the home canning of beefsteak and chicken by different methods of preheating and in containers of different kinds and sizes.

Wheat: Pre-eminence as a cereal food; nutritive value; relation to health and disease (*Imp. Bur. Anim. Nutr. [Aberdeen], Tech. Commun. 7 (1936), pp. 31*).—In this communication the psychological and economic reasons for the overwhelming preference for wheat in the human dietary are considered. The nutritive value of wheat is compared with that of other common cereals. Communities living on an adequate diet containing milk, fruits, vegetables, and other protective foods generally use wheat as their staple cereal. In such communities disease due to faulty nutrition is not a major problem. At

present there is no nutritional reason for advocating the increased consumption of wheat among the advanced peoples of European and North American countries, and in the interests of public health the surplus wheat should be used as a feed for stock, thus converting it into the nutritionally superior commodities milk, butter, eggs, and meat. The traditional dietary habits of rice- and corn-eating peoples might profitably be changed in favor of a larger consumption of wheat.

Shortening value and flavor of culinary fats (*Indiana Sta. Rpt. 1936, pp. 48, 49*).—This progress report (E. S. R., 75, p. 877) deals with the tenderness and desirability of flavor of wafers made from two open-kettle rendered lards from the fat of hogs fed on known rations, one commercial lard, a commercial hydrogenated vegetable fat, and a partially hydrogenated lard prepared from a lard rendered from the fat of hogs fed on a known ration.

The storage of black-walnut kernels, R. B. Dustman (*Food Res., 1 (1936), No. 3, pp. 247–253*).—In this investigation at the West Virginia Experiment Station of the factors involved in the keeping quality of walnuts, the freshly shelled kernels were dried in the dark for 24 hr. at room temperature to reduce the moisture content from 9.62 to 4.14 percent, packed in wide-mouth glass bottles with screw caps or rubber stoppers and in glass test tubes, and sealed in atmospheres of air, nitrogen, hydrogen, carbon dioxide, and vapors of ethyl alcohol with air or nitrogen. The samples were stored under the temperature conditions of ordinary unheated cellar storage with a range of from −8.3° to 26.7° C., of fruit storage from 0.6° to 2.2°, and of frozen storage from −17.8° to −12.2°. At various intervals of time up to 3 yr. the stored walnuts were judged for palatability by a tasting squad and were examined for rancidity by a modified Kreis test on samples of expressed oil.

The samples stored in sealed glass tubes were generally superior to those stored in bottles. The most satisfactory results from the standpoint of convenience and quality of the product were obtained by storage in an atmosphere of nitrogen at temperatures near the freezing point, which allows the retention of a satisfactory flavor and palatability over a period of 2 yr. or longer. Vacuum, carbon dioxide, or hydrogen may be substituted for the nitrogen, resulting in only a slight lowering in the quality of the stored walnut meats. Any treatment which includes reduced temperature and exclusion of air or oxygen will assist in preserving the original flavor of the nuts.

The control of staphylococci in custard-filled puffs and éclairs, J. Stritar, G. M. Dack, and F. G. Jungewaelter (*Food Res., 1 (1936), No. 3, pp. 237–246, figs. [5]*).—A method is described for the pasteurization of custard-filled puffs and éclairs to destroy *Staphylococcus aureus* organisms if present in the filling without impairing the flavor or appearance of the pastries. The most satisfactory results were obtained when the filled products were reheated uncovered in the oven at temperatures ranging from 375° to 425° F. a 30-min. period. The crispness of day-old shells was renewed by the reheating.

[Nutrition studies by the Illinois Station] (*Illinois Sta. Rpt. 1935, pp. 289–294*).—Progress reports (E. S. R., 74, p. 568) are given on studies by C. R. Meyer in continuation of attempts to identify an unknown factor essential for lactation present in certain parts of oats and in hydrogenated cottonseed oil by J. Outhouse and Meyer on the relative vitamine A value of several varieties of yellow corn and on the value of carotene in comparison with halibut-liver oil as a source of vitamin A for children as determined by the Jeans test, using a Birch-Hirschfeld visual photometer, and by Outhouse in continuation of the investigation of the bone-calcifying properties of lactose.

The relation of season, sex, and weight to the basal metabolism of the albino rat, T. C. SHERWOOD (*Jour. Nutr., 12 (1936), No. 3, pp. 223–236*).—The author reports 1,962 basal metabolism tests made on 70 male and 100 female adult normal rats receiving a well balanced dry ration supplemented with fresh whole milk and green plants, and kept in an environmental temperature of approximately 26° C. A modification of the Haldane open circuit type of apparatus was used, and the tests were made after an 18-hr. fast during a 3-hr. testing period.

The results did not show a seasonal variation in basal metabolic rate in all weight groups. The adult rats weighing above 180 g showed a somewhat lower basal metabolism during the summer months. When measured in calories per unit of surface area, a 26-percent decrease in heat production was shown in the animals ranging in weight from 100 to 420 g. When measured in calories per kilogram of body weight, a 42-percent decrease was shown for the same weight group. A comparison between 50 males and 50 females of equal weight demonstrated that in the larger animals there was a slightly higher heat production in the male than in the female, while the young animals had approximately the same basal metabolic rate. During active sexual life the basal metabolic rates of male and female rats varied, and as the rats approached the end of the period the rates became approximately the same.

The heat produced was calculated for surface area, using the Diack formula,[3] as well as for weight. The weight technic proved to be slightly the more reliable.

Increase in height and weight and decrease in age of college freshmen over a period of twenty years, L. B. CHENOWETH (*Jour. Amer. Med. Assoc., 108 (1937), No. 5, pp. 354–356, figs. 3*).—From records of the physical measurements of students of the University of Cincinnati, data have been tabulated by sex on the average height, weight, and age of 8,968 young men and 4,124 young women entering the university each year from 1916 to 1935, inclusive.

The results show that the entering students are younger, taller, and heavier now than 20 yr. ago. These findings are thought to indicate that "a definite racial betterment is taking place in the United States, and that the improvement is only partially influenced by social and economic position."

Basal metabolism of normal young men and women of various races in Hawaii, C. D. MILLER and F. G. BENEDICT (*Hawaii Ter. Med. Assoc., Ann. Mtg., Trans., 46 (1936), Sci. Sess., pp. 27–29*).—This is a brief report of an extensive study at the University of Hawaii of the basal metabolism of 115 men and 122 women between the ages of 18 and 30 yr. of the following racial groups: Japanese, Chinese, Caucasian, Chinese-Hawaiian, and Hawaiian mixtures. The work is a part of the world-wide survey of basal metabolism sponsored by the Nutrition Laboratory of the Carnegie Institution of Washington. The tabulated data, grouped by race for men and women separately, show a minus deviation from the Harris-Benedict prediction standards for all racial groups, with a greater deviation for females than males. Of the females, the greatest deviation was −15 for the Chinese and the least −7.3 for the Hawaiian mixed group. The value for the Chinese women confirms previous work of Benedict and coworkers indicating that Chinese women have a definitely lower basal metabolism than Caucasian women.

Cholesterol feeding and fat metabolism, R. P. COOK (*Biochem. Jour., 30 (1936), No. 9, pp. 1630–1636, figs. 4*).—In this preliminary experiment the author studied the action of cholesterol in producing disorders of fat metabolism in rats

[3] Jour. Nutr., 3 (1930), No. 3, pp. 289–296.

and guinea pigs. Groups of rats were maintained on fat-free and normal synthetic diets supplemented by approximately 0.25 g daily of a commercial preparation of cholesterol. The guinea pigs received a stock diet containing a small amount of fat and supplemented by approximately 0.8 g of cholesterol per day.

The cholesterol feedings caused a decreased growth rate and the development of fatty livers only in those rats receiving a diet containing fat. The rats on the fat-free diets showed no effects due to the absence of absorption. The guinea pigs proved to be very susceptible to the action of cholesterol, and fatty livers were produced in animals receiving the low fat diet. The action of cholesterol appeared in part to be the mobilization of fat in the liver, accompanied by a marked decrease in depot fats.

Respiration and ketogenesis in the "cholesterol" fatty liver, R. P. Cook and N. L. Edson (*Biochem. Jour., 30 (1936), No. 9, pp. 1637–1639*).—In continuation of the study noted above, the changes resulting from the feeding of cholesterol were studied further. Respiration and ketogenesis of control and of cholesterol-fed animals were studied both in the presence and absence of sodium butyrate. The rats receiving a fat-free diet and the guinea pigs receiving the stock diet supplemented by cholesterol failed to develop fatty livers during the short experimental period. After feeding fat-free diets supplemented by cholesterol for longer periods, the liver tissues of the rats showed a significantly lower response in the presence and absence of sodium butyrate, whereas there was no significant change of respiration noted in the guinea pigs, but the ketone body formation in the presence of the substrate was decreased. The "spontaneous" ketone body formation found in the livers of the animals receiving the fat-free diet plus cholesterol was less than in the livers of rats starved for 24 hr. In general the changes noted were small.

Vitamin content of important foods in the child's diet, C. R. Fellers (*Amer. Jour. Pub. Health, 25 (1935), No. 12, pp. 1340–1345*).—This article, which constitutes Contribution 222 of the Massachusetts Experiment Station, is a short summary of some of the results obtained at the station in vitamin content studies on foods of special importance in the diet of infants and children. These studies have been noted from other sources.

Further studies of the content of vitamins A and B in canned strained vegetables, F. Hanning (*Jour. Amer. Dietet. Assoc., 12 (1936), No. 3, pp. 231–236; abs. in Michigan Sta. Quart. Bul., 19 (1937), No. 3, p. 196*).—In continuation of the studies on the vitamin content of canned strained foods of a single brand (E. S. R., 73, p. 883), several vegetables were examined for their vitamin A content by the method of Sherman and Munsell and for their vitamin B content by the Chase and Sherman method, using rat harnesses to prevent coprophagy.

The range of vitamin A values for the 1932 and 1933 products, expressed in international units per ounce were as follows: Spinach from 3,339 to 3,594, carrots from 1,792 to 1,887, tomatoes from 1,108 to 1,326, peas from 270 to 327, and green beans from 196 to 344 units. These values do not vary greatly from the 1930 and 1931 determinations except for the increase in vitamin A potency of peas and green beans.

The range of vitamin B values for the 1934 products, expressed in international units per ounce, were as follows: Tomatoes from 7 to 12.1, peas 8.2, carrots 3, green beans 3, beets 1, and spinach 1.6 units. All the vitamin B values were higher than those reported for the 1932 products. This increase may be due to an improved method of canning or a seasonal variation in the raw vegetables, or both.

The influence of vitamins A, B, or D, anemia or fasting upon the rate of fat absorption in the rat, M. H. IRWIN, H. STEENBOCK, and A. R. KEMMERER (*Jour. Nutr., 12 (1936), No. 4, pp. 357–364*).—In continuation of a series of experiments conducted at the Wisconsin Experiment Station (E. S. R., 77, p. 132), the authors determined whether the rapid absorption of halibut-liver oil, hydrogenated fat (vegetable shortening), and vegetable salad oil may be attributed to their vitamin A and D contents. The effects of vitamin B, anemia, and fasting on the rate of absorption were also determined. The technic previously described was followed, using the 4-hr. absorption period.

The fats and oils tested on normal adult rats and their relative absorptions were untreated halibut-liver oil 70 percent, halibut-liver oil aerated to destroy vitamin A 58, aerated halibut-liver oil with 28,000 blue units of vitamin A added 54, hydrogenated vegetable oil 54, and hydrogenated vegetable oil with 28,400 blue units of vitamin A 49 percent.

The effect of vitamin A depletion in the animals on the rate of absorption was tested on young rats which had been kept on a vitamin A-free diet for 7 weeks. The absorption values obtained for these were hydrogenated fat 30 percent and hydrogenated fat plus 26,400 blue units of vitamin A 31 percent. Normal controls of about the same weight absorbed 56 percent of the untreated fat. These results indicate that the addition of vitamin A to a fat does not affect its rate of absorption by normal rats, but that rats deprived of vitamin A absorb fat less readily than normal animals.

Similar results were obtained for vitamins B and D. The addition of either of these vitamins to a fat had no effect upon its absorption by normal rats, but rats depleted of the vitamin absorbed the fats less readily. However, anemic rats, others fasted 6 days, and others fed a limited quantity of a complete diet also absorbed fat less readily than normal animals, and the addition of these vitamins to a fat has no effect upon the rate of absorption by normal rats. It is evident that a decreased rate of absorption in avitaminosis may be ascribed secondarily to a poor physical condition due to faulty nutrition rather than to the specific lack of vitamin A, B, or D.

The influence of certain hydrotropic and other substances upon fat absorption, M. H. IRWIN, J. WEBER, and H. STEENBOCK (*Jour. Nutr., 12 (1936), No. 4, pp. 365–371*).—Following the technic previously described, a commercial hydrogenated vegetable shortening was used as the base fat and was followed immediately by 1 cc of a water solution of the substance being tested.

The control animals receiving the hydrogenated fat alone showed an absorption value of 54 percent, and those receiving the fat followed by 1 cc of distilled water absorbed 55 percent. The following fat absorption values were obtained when 1 cc of distilled water containing the test material was fed immediately after the 1.5 g of hydrogenated fat: 1 mg of commercial bile salts 53 percent, 1 mg of sodium benzoate 50, 5 percent of ethyl alcohol 51, 1 g of peptone 27, 1 g of sucrose 33, 1 g of peptone plus 1 g of sucrose 25, 0.2 mg of potassium chloride 48, 0.2 mg of calcium chloride 54, 2 mg of sodium acid phosphate 47, and 2 mg of sodium glycerophosphate 47 percent. When 50 mg of bile salts, sodium benzoate, or sodium glycerophosphate were fed, the absorption values were, respectively, 55, 38, and 38 percent. When 100 mg of potassium chloride or calcium chloride were given, the absorption values were, respectively, 34 and 26 percent. Feeding 10 percent of glycerol gave an absorption value of 43 percent and 40 percent of ethyl alcohol 27 percent. The administration of 500 mg of bile salts, sodium benzoate, and sodium glycerophosphate gave values of 19, 14, and 29 percent, respectively.

These data indicate that the feeding of small amounts of any of these substances has little or no effect, but larger amounts cause a definite decrease in the rate of fat absorption.

The transmission of vitamin A from parents to young in mammals.—V, The vitamin A and carotenoid contents of human colostrum and milk, W. J. DANN (*Biochem. Jour.*, *30* (*1936*), *No. 9, pp. 1644–1651, figs. 3*).—This continuation of the series noted previously (E. S. R., 73, p. 881) presents quantitative data on the vitamin A contents of colostrum and early milk of 42 white and 69 colored women, aged from 14 to 41 yr. and ranging from primiparae to one 11-parous subject. Singles samples of colostrum were obtained shortly after secretion and those of early milk several days later. The diet was poor during pregnancy and liberal after delivery. Cod-liver oil supplement was given to some subjects during pregnancy. The vitamin A and carotenoids were extracted and measured colorimetrically. The results were expressed as yellow units (Y) of carotenoids and blue units (B) of vitamin A and the total vitamin A activity was estimated.

The vitamin A content of colostrum varied from 0 to 2,625 B per 100 cc and the carotenoid content from 20 to 1,540 Y. The estimated total biological activity ranged from 56 to 2,172 international units per 100 cc. The vitamin A and carotenoid contents of the colostrum were of the same order as in cow's colostrum and could not be correlated with the age of the patient, number of birth after which colostrum was taken, or length of time after birth until colostrum was obtained. The vitamin A content of the colostrum was not increased by regular ingestion of cod-liver oil during pregnancy. The vitamin A content of the milk varied from 0 to 2,000 B and the carotenoid content from 0 to 800 Y per 100 cc. The estimated biological activity ranged from 0 to 1,860 international units per 100 cc. The vitamin A and carotenoid contents of early milk of the women subjects were much higher than those of cow's milk. The ratio of the amounts of vitamin A in colostrum and early milk was less than 3 in 70 percent of the cases studied. Human colostrum apparently has no function in the provision of a reserve supply of vitamin A for the infant at birth.

Evaporated milk: Effect of irradiation on vitamin A content, H. J. CANNON and O. F. HIXSON (*Indus. and Engin. Chem.*, *28* (*1936*), *No. 9, pp. 1009, 1010, figs. 5*).—Irradiated and nonirradiated evaporated milks were assayed for vitamin A according to the U. S. P. technic (1934) (E. S. R., 71, p. 583) and using the U. S. P. reference cod-liver oil for the standard. Each sample of the milk tested was a mixture of three nationally known brands. The results were identical, both the irradiated and nonirradiated evaporated milks containing 4.28 U. S. P. units of vitamin A per gram (1,767 units per 14.5-oz. container).

Influence of avitaminosis A on experimentally produced cutaneous infections in rats, T. H. STERNBERG and D. M. PILLSBURY (*Arch. Dermatol. and Syphilol.*, *35* (*1937*), *No. 2, pp. 247–250*).—Two groups of young rats receiving a vitamin A-deficient diet consisting of casein 18 percent, agar 2, salt 40 4, yeast 6, dextrinized starch 70 percent, and 3 drops of viosterol per kilogram of diet were infected intradermally with streptococcus and staphylococcus organisms and the severity and duration of the resulting infections were observed. The 10 rats in group A showed definite signs of vitamin A deficiency when inoculated, and group B was composed of 10 normal rats receiving a supplement of 0.2 cc of cod-liver oil three times a week at the time of inoculation.

Definite evidence of a minimal grade infection lasting from 5 to 10 days was noted in 8 rats of group A and 9 rats of group B. "Avitaminosis A in rats has no apparent effect on the resistance of the skin to experimentally produced infection with streptococci and staphylococci."

Vitamin B assay, using rat curative method with modified diets and oral administration of addenda, F. P. Dann (*Jour. Nutr., 12 (1936), No. 5, pp. 461–468*).—The Ammerman and Waterman modification (E. S. R., 76, p. 423) of the diet used by Smith in the rat curative method for vitamin B_1 has been further modified by the addition of an amount of yeast supplying about one-third of the vitamin B requirement for growth at a rate of 3 g weekly. This was accomplished by adding 400 g of dried dehydrated brewers' yeast (Northwestern) containing 13.3 Sherman vitamin B_1 units per gram to 100 lb. of the diet. The incidence of polyneuritis was much higher on this diet, there being only 31.1 percent of the animals discarded as compared with 54.8 percent on the Smith diet and 55.7–58.1 percent on the Ammerman and Waterman diet. The technic followed in the test is described, and various precautions necessary to follow for accuracy are listed.

Quantitative estimation of lactoflavin and of vitamin B_6 in cow's milk and in human milk, P. György (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 1, pp. 204–207*).—In this investigation, conducted at Cleveland, Ohio, the various supplements to the basal vitamin B-(complex) free diet were crystalline vitamin B_1, lactoflavine, and a vitamin B_6 concentrate consisting of a yeast preparation obtained by the Peters method (E. S. R., 70, p. 153), 1 cc of which was equivalent to about 1 rat day dose of vitamin B_6, this term being defined as the minimum quantity of the substance that would cause healing of the specific "dermatitis." Similarly, the rat day dose for the estimation of lactoflavine was defined as the minimum quantity of the substance which would give rise to a gain in weight of about 10 g per week for at least 4 weeks.

Graded doses of from 5 to 15 cc of fresh raw certified and pasteurized milk were fed in place of the flavine and vitamin B_6 concentrate, respectively, to from 4 to 6 rats at each level. The values obtained were compared with previous values reported by the author for milks tested in Cambridge, England (E. S. R., 75, p. 283).

The rat day dose for lactoflavine was about 5 cc for Cleveland milk and 10 cc for Cambridge milk, while that for vitamin B_6 was from 5 to 10 cc for both milks, being slightly higher for the Cleveland milk. The vitamin B_6 values were practically the same for the certified and pasteurized milk tested in Cleveland, and the lactoflavine values for certified milk were slightly higher.

Earlier workers have established the fact that the limiting factors for rats are vitamin B_1 in cow's milk and vitamin G (B_2) in human milk. To find which component of vitamin G determines the low potency in human milk, the milk of five lactating women was analyzed and doses varying from 3 to 15 cc of the fresh milk were tested on rats. Since the rat day dose of lactoflavine could not be reached even when 15 cc of the milk were given daily, while the vitamin B_6 unit was found to be about 5 cc, it was concluded that in human milk the lactoflavine represents the limiting factor. The addition of pure crystalline lactoflavine to human milk would increase its vitamin G potency.

Bisulphite binding substances in the blood in health and in disease, particularly vitamin B_1 deficiency, R. W. Wilkins, F. H. L. Taylor, and S. Weiss (*Soc. Expt. Biol. and Med. Proc., 35 (1937), No. 4, pp. 584, 585*).—Data are presented in this preliminary report indicating that determinations of the bisulfite-binding substances in the blood are of no aid in diagnosing vitamin B_1 deficiency, as an elevation of this value is also found in a variety of other diseases.

Vitamin B complex therapy in chronic arthritis, C. LeR. Steinberg (*Amer. Jour. Digest. Diseases and Nutr., 3 (1936), No. 10, pp. 765, 766*).—This is a study of the effect of administering vitamin B complex to 105 patients with atrophic

and 13 patients with hypertrophic arthritis, showing symptoms of gas, constipation, and anorexia, with occasional diarrhea, heartburn, and epigastric pain present in some cases. "Vitamin B complex" in doses of from 4 to 12 cc daily was given to 108 patients, 10 received one cake of brewers' yeast daily, and in 3 patients the vitamin B complex was alternated with 30 cc of a live strain of brewers' yeast.

Within from 1 to 3 weeks the gastrointestinal symptoms were alleviated in over 95 percent of the cases. The cessation of the vitamin administration resulted in the return of the symptoms in about 50 percent of the cases. The administration of large doses of vitamins A and D to 20 cases of chronic arthritis did not change the already improved status of the gastrointestinal symptoms. The vitamin B complex appears to be of adjunct value in the treatment of chronic arthritis.

Comparison of the biological and chemical methods for the determination of vitamin C in canned strained vegetables and a study of its variation from year to year, F. Hanning (*Jour. Nutr., 12 (1936), No. 4, pp. 405–412; abs. in Michigan Sta. Quart. Bul., 19 (1937), No. 3, p. 196*).—The author presents data obtained during the 5-yr. study referred to on page 421 to show that the chemical method of determining vitamin C by titration with sodium 2,6-dichlorobenzenoneindophenol is accurate and agrees remarkably well with the results of biological tests made on the same samples by the Sherman, LaMer, and Campbell method (E. S. R., 46, p. 865).

The variations in vitamin C content of the vegetables packed from 1930 to 1935 were determined by the same methods, using from 24 to 60 sample cans of each vegetable. A marked variation in potency was noticed, particularly in the tomatoes, which ranged from 64 to 142 international units per ounce. Spinach showed a variation of from 18 to 27 units in the 1930–32 packs and from 50 to 85 units in the 1933–35 packs. The content in green beans varied from 9 to 23 units and in peas from 32 to 53 units per ounce in the 5-yr. period. It is concluded that even under carefully controlled conditions the standardization of the vitamin C potency is difficult.

The determination of vitamin C by means of its influence on the body weight of guinea-pigs, K. H. Coward and E. W. Kassner (*Biochem. Jour., 30 (1936), No. 9, pp. 1719–1727, figs. 2*).—A growth method is described for the estimation of vitamin C similar to the method advanced by the author for estimating vitamin A (E. S. R., 68, p. 565), with increase in weight of young growing guinea pigs as criteria. When the accuracy of the method was calculated, it was found to be no greater than that of Höjer's "tooth structure" method. The relative merits of the two methods are discussed, and it is concluded that the latter has distinct advantages.

Vitamin-C content of dairy orange beverages, M. J. Mack, C. R. Fellers, W. A. Maclinn, and D. A. Bean (*Food Res., 1 (1936), No. 3, pp. 223–230*).—In this study at the Massachusetts Experiment Station the vitamin C content of 10 dairy orange beverages, with fresh and canned orange juice for comparison, was determined biologically and also by titration with 2,6-dichlorophenolindophenol and with iodine. Good agreement was shown in the results obtained by the three methods. Of the two chemical methods, the iodine titration was found to give the more constant and easily reproducible results. The vitamin C values obtained by the chemical method ranged from 0.003 to 0.093 mg per gram (0.2 to 53 units of vitamin C per ounce) as compared with from 228 to 258 units for fresh and somewhat over 200 units for canned orange juice.

The losses of vitamin C on storage were also determined for 2 of the dairy orange beverages. At room temperature the losses were rapid and extensive. At cold storage temperatures the losses were much less but still significant.

These findings indicate that at best dairy orange beverages are only fair antiscorbutics and cannot be considered satisfactory substitutes for fresh or canned orange juice.

The vitamin C content of the human tonsil, M. M. Clayton and J. D. Keith (*Science, 84 (1936), No. 2128, pp. 377, 378*).—Vitamin C values ranging from 10.6 to 47.6 mg of ascorbic acid per 100 g of tissue were found in the analysis of tonsils of 54 persons, mostly children, on the day of tonsillectomy. The average value was 24 mg, with a standard deviation of 6.4 mg. The tonsils of 3 children who had been given 400 cc of orange juice daily for periods of from 5 to 12 days before the operation had an average vitamin C content of 42.9 mg per 100 g of tissue. In one of these subjects the urinary excretion of vitamin C for the 24 hr. immediately preceding the operation was 140 mg. As the subject had been taking 400 cc of orange juice daily, containing approximately 240 mg of vitamin C, for 11 days preceding the operation, it is thought that the tissues must have been saturated with vitamin C at the time of operation.

Combined ascorbic acid in food-stuffs, B. C. Guha and J. C. Pal (*Nature [London], 137 (1936), No. 3475, p. 946*).—Conflicting observations of the state in which ascorbic acid is present in certain natural foodstuffs are reviewed briefly, and evidence is summarized which, in the opinion of the authors, demonstrates "almost conclusively that the increase of the vitamin C value of certain foodstuffs on boiling cannot be accounted for on the oxidase theory, and that part of the vitamin in the natural foodstuffs is present in the combined state." The evidence is essentially as follows:

When cabbage is treated with absolute alcohol in the presence of anhydrous sodium sulfate, an extract is obtained which, when heated for 4 min. on a boiling water bath in an atmosphere of nitrogen, invariably gives an increase in vitamin C value as determined titrimetrically on the order of from 50 to 100 percent. Heating the extract similarly at 36° C. for 10 min. gives a considerable increase in vitamin C value, often of the order of 50 percent. An extract similarly prepared with ether instead of alcohol in the presence of anhydrous sodium sulfate gives no test for vitamin C, but when heated in an aqueous medium in a boiling water bath for 4 min. in an atmosphere of nitrogen gives a considerable vitamin C value even if the titration is carried out after mercuric acetate or formaldehyde treatment to remove interfering substances. A common Indian fruit, bel (*Aegele marmelos*), was said to give similar results as cabbage, although the increase was not so marked. Ripe and unripe mangoes do not show an increased vitamin C value under the same treatments.

The state of ascorbic acid in plant tissues, G. L. Mack (*Nature [London], 138 (1936), No. 3490, pp. 505, 506*).—In this contribution from the New York State Experiment Station the various explanations which have been advanced for the apparent increase in the amount of titratable ascorbic acid in some plant tissues after being heated in boiling water are discussed, with particular emphasis on the earlier observation of Tillmans et al. (E. S. R., 69, p. 8) that with certain vegetables the titrimetric method agrees with the biological only if the oxidized ascorbic acid is reduced with hydrogen sulfide, and the further observation that this oxidation, which occurs during the extraction, may be prevented by heating before extraction or by extraction with stronger acid. The reports of Ahmad (E. S. R., 76, p. 426) and of Guha and Pal noted above are cited as showing that the facts brought out by Tillmans et al. have been overlooked by later workers.

Data are reported on a repetition of the experiments with cabbage of Guha and Pal. These are in agreement with the observation of Tillmans et al. and

in disagreement with those of Guha and Pal. The samples of cabbage examined by the author "did not contain appreciable amounts of ascorbic acid in a combined state. If the enzyme is inactivated by heat or alcohol, or inhibited by extracting with sufficiently strong acid, the total amount of ascorbic acid is obtained. The fact that practically none of the ascorbic acid is recovered by acidifying or heating an aqueous extract indicates that nearly all the apparent increase on cooking is due to the inactivation of the enzyme."

Intramuscular injection of ascorbic (cevitamic) acid and excretion in the sweat, A. Lilienfeld, I. S. Wright, and E. MacLenathen (*Soc. Expt. Biol. and Med. Proc.*, 35 (1936), No. 1, pp. 184–189, figs. 4).—Afebrile patients of varying ages and degrees of vitamin C saturation were used as subjects. Following determination of the content of cevitamic acid in urine and blood, 4 cc of a solution containing 200 mg of the vitamin was injected intramuscularly daily for 3 days, and urine samples were collected every hour for 3 hr. and as passed for the remainder of the 24-hr. period. On the third day three hourly blood specimens were taken.

In cases in which the dietary history showed a good vitamin C intake and the initial values for urinary excretion and blood level were high, the first injection was followed by an immediate increase of cevitamic acid in the urine which persisted throughout the experimental period. Where the vitamin C intake had been only fair and the initial values for urinary excretion and blood level were correspondingly reduced, the increase in urinary excretion was not so pronounced. With an inadequate C intake and very low initial values, injections did not raise the urinary excretion. Low C values noted in a subject perspiring profusely suggested possible excretion in the sweat.

In all three groups the blood level of cevitamic acid was increased, the peak being reached and maintained on the first and second hours after injection and dropping rapidly in the third hour toward the initial level. The height of increase in the blood level was reached more slowly and maintained for a longer time following intramuscular than intravenous injections of cevitamic acid. Intramuscular injections are recommended in cases where cevitamic acid is improperly absorbed through the gastrointestinal tract or where intravenous administration is not possible.

Some observations on the reduction of iron by tissue extracts and by ascorbic acid, with a note on the stabilization of ascorbic acid solutions, W. D. McFarlane (*Biochem. Jour.*, 30 (1936), No. 8, pp. 1472–1478).—In a series of experiments with guinea pigs receiving the Harris scurvy-producing ration (E. S. R., 67, p. 650), the author observed that the daily injection of 3 mg of ascorbic acid cured the secondary anemia associated with the scurvy. It is suggested that ascorbic acid may play a role in iron metabolism by reducing the ferric iron of the blood prior to its storage in the liver in the reduced form.

The ascorbic acid content of several tissues was estimated by means of their reducing capacity for 2,6-dichlorophenolindophenol and ferric iron, and it was shown that in each tissue there was sufficient ascorbic acid to retain all the iron in the ferrous form. From the results of experiments in vitro on the reduction of ionic iron, iron in combination with protein, ferric lactate, and ferric glutamate by ascorbic acid, it would appear that some iron-protein compound is involved in the reduction of tissue iron in vivo by ascorbic acid.

The following materials in order of decreasing activity were shown to protect ascorbic acid from copper catalysis: Sodium diethyldithiocarbamate, cystine, cysteine, and glutathione. The addition of αα'-dipyridyl and sodium diethyldithiocarbamate together inhibited the aerobic oxidation of ascorbic acid in orange juice. Glutathione had practically the same effect.

The estimation of reduced ascorbic acid in blood serum and plasma, F. H. L. TAYLOR, D. CHASE, and J. M. FAULKNER (*Biochem. Jour., 30 (1936), No. 7, pp. 1119–1125, figs. 2*).—A method for the estimation of small amounts of reduced ascorbic acid in blood is described. This is said to have no interference from phenols, uric acid, amino acids, urea, creatinine, and glucose under the conditions of the experiment, although, as has been previously reported by Harris and Ray (E. S. R., 70, p. 426), there is interference from thiosulfate.

Determinations by this method on the blood serums of 33 normal persons gave reduced ascorbic acid content values ranging from 0.83 to 2.43 mg, with an average of 1.61 mg per 100 cc. In 10 scorbutic subjects 8 showed values below 0.4 mg, while 2 showed values of 0.42 and 0.55 mg per 100 cc, respectively. When 1 g of ascorbic acid was administered orally to a normal young adult, the fasting serum level changed from 1.57 to 2.29 mg in 1 hr. and returned in 5 hr. to approximately the initial level. At a later period 1 g of the vitamin was injected intravenously into the same subject when the fasting blood serum level was 1.21 mg per 100 cc. In 30 min. the serum value was 3.49 mg, in 2 hr. 2.17, and in 4 hr. 2.3 mg. Upon the intravenous administration of 1 g of ascorbic acid into a scorbutic patient, the blood serum level rose from 0.61 to 2.58 mg in 30 min., and in 1½ hr. fell to 1.24 mg, where it remained for at least 48 hr. Later when 1 g of ascorbic acid was given orally to the same subject maintained on a vitamin C-free diet, the serum level changed from 1.14 to 1.7 mg in 3 hr., and within 24 hr. had returned to approximately the initial level.

Toxic secondary actions of ascorbic acid—hypervitaminosis C? [trans. title], F. WIDENBAUER (*Klin. Wchnschr., 15 (1936), No. 33, pp. 1158, 1159*).—The administration of test doses of ascorbic acid (Redoxon) varying from 100 to 6,000 mg to 29 infants, 93 preschool and school children, and 20 adults gave rise to secondary toxic symptoms in only 5 adults and 4 infants. The author concludes that these 9 cases possessed a special sensitivity to vitamin C.

An outline of studies relating to vitamin C deficiency in rheumatic fever, J. F. RINEHART (*Jour. Lab. and Clin. Med., 21 (1936), No. 6, pp. 597–608*).—The author reviews the experimental basis for the concept that rheumatic fever may be the result of the combined influence of vitamin C deficiency and infection (E. S. R., 71, p. 428), summarizes further experimental studies confirming and extending the original findings and certain epidemiological and clinical observations bearing on the problem, and discusses the essential pathology of rheumatic fever and vitamin C metabolism with relation to vitamin C theraphy in rheumatic fever. Two approaches to the final solution of the problem are suggested—(1) to determine if optimal vitamin C nutrition over an adequate period of time will prevent susceptible groups from getting rheumatic fever, and (2) to determine if a high vitamin C intake by rheumatic children over a long period of time will materially reduce the tendency to recurrence.

The inverse relation between growth and incidence of cataract in rats given graded amounts of vitamin G-containing foods, P. L. DAY and W. J. DARBY (*Jour. Nutr., 12 (1936), No. 4, pp. 387–394, fig. 1*).—In continuation of previous studies (E. S. R., 72, p. 730), series of vitamin G assays were made on a number of food materials. About 200 young rats were fed the vitamin G-deficient diet No. 625 which was previously described. At the end of 2 weeks each animal was given a predetermined weighed amount of one of the test foods, 3 or 6 times weekly for 8 weeks. The control animals received no supplement and were observed until death. The food materials fed included several kinds of cheese, liver extract, yeast, lamb, pork, pork liver, ham, and bacon.

The rats receiving the vitamin supplement, grouped according to growth during the 10-week period, showed the following incidence of cataract: Rats gaining 20 g or less, 39 percent developed cataract; 21–40 g, 26 percent; 41–60 g, 14 percent; and more than 60 g, 0 percent. Of the control animals, 86 percent developed cataract before death, with 63 percent of the group showing eye changes during the 10-week period. An inverse relationship evidently exists between growth and the appearance of cataract. The data indicate that only a small amount of vitamin G is required to prevent cataract, and that growth is a measure of the cataract-preventive property of the vitamin supplement.

Blood sugar in rats rendered cataractous by dietary procedures, P. L. Day (*Jour. Nutr., 12 (1936), No. 4, pp. 395–404, fig. 1*).—The experiments of Mitchell and Dodge (E. S. R., 74, p. 418) on the production of cataract in rats fed on high lactose rations were repeated to determine whether animals receiving high percentages of galactose and lactose would show significant hyperglycemia when compared with animals receiving other common glycogen-forming carbohydrates. Young rats were given an adequate diet containing various carbohydrates as 60 percent of the diet, with 18 percent casein, 4 percent salt mixture, 2 percent cod-liver oil, 6 percent fat, and 10 percent dried yeast. The Folin micromethod was followed for the blood sugar determinations by tail bleeding. Carbohydrate tolerance tests were made upon representative litter mates receiving different carbohydrates. Weight, food intake, and ophthalmoscopic records were made weekly. Other groups of young rats were given the vitamin G-deficient diet No. 625, with litter mates receiving a dried yeast supplement.

Seventeen out of 18 rats receiving lactose developed cataract at an average time of 44 days. Three rats receiving galactose exhibited cataract on the eleventh day and also showed the highest blood sugar level. The mean of 27 blood sugar determinations upon galactose rats was 372 mg, and the highest level was 556 mg as compared with 160 mg for the mean of 89 determinations upon lactose rats and the highest value of 234 mg. Glucose, sucrose, and starch did not cause cataract. A different kind of cataract was produced in the young growing rats receiving the vitamin G-deficient diet. The mean of 40 determinations of the blood sugar level upon 21 vitamin G-deficient rats was 107 as compared with 118 for 38 determinations upon 9 normal control rats. The cataract resulting from lactose or galactose feeding, especially during the early stages, is quite different in appearance from the cataract caused by avitaminosis.

The cataract-preventive vitamin (flavin) in cheese, P. L. Day and W. J. Darby (*Food Res., 1 (1936), No. 4, pp. 349–355, figs. 4*).—Three kinds of cheese were assayed for flavine, using growth and the prevention of cataract as the criteria for the presence of the vitamin and following the biological method described above, with American and Swiss kinds of cheese fed at 0.2-, 0.4-, and 0.8-g and cream cheese at 0.4-, 0.8-, and 1.6-g levels to groups of from 7 to 9 rats.

Expressed in Bourquin-Sherman units per gram, the contents of flavine were found to be for American cheese 2 units, Swiss 1.5, and cream cheese 0.36 units. Calculations based on unpublished preliminary data which indicated that 4 μg of lactoflavine are approximately equivalent to 1 Bourquin-Sherman unit of vitamin G gave the following values: American cheese, 8 μg of lactoflavine per gram, Swiss 6, and cream cheese 1.4 μg per gram. Since a high incidence of cataract was noted among the groups of rats receiving small cheese supplements, and since from 86 to 100 percent of those maintained on the basal ration unsupplemented also developed cataract, it was concluded that

the flavine is "cataract preventive" as well as "growth-promoting." The incidence of cataract was markedly reduced and greater growth resulted when the larger amounts of cheese were fed.

HOME MANAGEMENT AND EQUIPMENT

Index numbers of the cost of goods and services bought by farm families in New York, 1920 to 1935, H. Canon and M. Rollins (*[New York] Cornell Sta. Mem. 199 (1937), pp. 23, figs. 5*).—The construction of the index numbers presented was undertaken to obtain a measure of the relative changes from year to year in the cost of goods and services bought by New York farm families. The items included in the index are food, clothing, furniture and furnishings, fuel and light, miscellaneous, and all items. Tables are given showing the individual articles used for each item, with the weights assigned, and other pertinent data.

On the basis of 1913 values as 100, the index of all items rose to 191.8 in 1920 and reached its lowest point, 117.9 in 1933, rising again to 134.9 in 1935. In 1920 the indexes for food, fuel, and light, and miscellaneous items were somewhat lower and for clothing and furniture and furnishings higher than the average for all items. The lowest levels for foods, 90.5, clothing, 102.1, and furniture and furnishings, 106.4, were reached in 1933. The index number for fuel and light showed a slight but steady decrease from the high point of 185.6 in 1920 to 152.7 in 1935. The index number for miscellaneous items reached a peak of 215.9 in 1930 and was at 194.8 in 1933, when most of the items were at their lowest figures.

A comparison of the index numbers of farm prices in New York for the years 1920–35 with the index numbers for all items in the present study showed that in only 4 yr.—1920, 1926, 1928, and 1929—did a given quantity of selected New York farm products purchase as much of a given quantity of goods and services for family living as in 1913. The greatest difference was in 1932 when the exchange value, on the basis of 1913 as 100, was only 61. In 1935 this value had reached only 75.

Home accounts help families plan saving and spending (*Illinois Sta. Rpt. 1935, pp. 300–306, fig. 1*).—This progress report on a continuation of the home account studies of R. C. Freeman and P. Nickell (E. S. R., 74, p. 574) summarizes the expenditures for 1934–35 of 231 farm families, of whom 100 had been keeping home account records for 3 yr., 42 for 5 yr., and a small number for 8 yr. The realized incomes and their distribution among various items of family living are compared for the entire number of farm families with the corresponding figures for 167 families in 1933–34, and the distribution of cash expenditures by 100 families who had been keeping accounts for at least 3 continuous years with the corresponding distribution in their records for 1933–34 and 1932–33.

Refrigeration for the farm household and farm produce (*Indiana Sta. Rpt. 1936, p. 48*).—This progress report summarizes the results of a survey of 144 rural homes in the State to obtain information on the adequacy of present refrigeration for the food supply of the farm household and farm produce.

The evolving house.—III, Rational design, A. F. Bemis (*Cambridge: Mass. Inst. Technol., 1936, pp. XXXV+625, pl. 1, figs. [205]*).—This volume of this series (E. S. R., 72, p. 428) contains chapters on efforts toward rational housing, what is rationalization, mass production and the house, standardization for house parts, the cube as a module, the theory of cubical modular design, applied cubical modular design, and cubical module in architectural

design, rational production, patents and the cubical modular method, and social significance of the cubical modular method. It also contains appendices on rectangularity of housing, comparative cost of inclined and flat roofs, multiple openings of various sizes and their relations to symmetry in modular walls, and modular patents; and a supplement entitled Survey of Efforts to Modernizing Housing Structure, by J. Burchard 2nd (pp. 327–625).

Recent developments in dwelling construction (*Fed. Housing Admin. Tech. Bul. 1, rev. (1937), pp. 17*).—This report represents the approach which is being made to better construction at lowered costs and an evaluation of the work which has been done, together with tentative conclusions as to its probable effect on the dwelling market. Brief descriptions of the different materials and methods of construction which are being tried out, together with lists of the individuals and concerns who have been engaged in such work, are also included. This includes some methods developed and used in Europe.

Low-cost housing (*Fed. Housing Admin. Circ. 3, rev. (1936), pp. 30*).—This covers in general terms the procedure involved in the insurance of mortgages on low-cost housing projects and sets forth the administrative rules and regulations governing such insurance.

MISCELLANEOUS

The design of experiments, R. A. Fisher (*Edinburgh: Oliver & Boyd, 1937, 2. ed., pp. XI+260, figs. 5*).—Plans for laying out experiments so that the results can be analyzed statistically are presented with details of agronomic experiments and methods of calculating significance, goodness of fit, and linkages in genetic studies.

A year's progress in solving farm problems of Illinois: [Forty-eighth Annual Report of Illinois Station, 1935], compiled and edited by F. J. Keilholz (*Illinois Sta. Rpt. 1935, pp. 331, figs. 40*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-ninth Annual Report of [Indiana Station], 1936, J. H. Skinner and H. J. Reed (*Indiana Sta. Rpt. 1936, pp. 95, figs. 33*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

Agricultural research through fifty years, 1885–1935 (*Minnesota Sta. Bul. 328 (1936), pp. 111, figs. 14*).—This contains the programs and addresses of the semicentennial celebration of the station (E. S. R., 73, p. 145).

Forty-ninth Annual Report [of Tennessee Station], 1936, [C. A. Mooers et al.] (*Tennessee Sta. Rpt. 1936, pp. 72, figs. 27*).—The experimental work reported is for the most part noted elsewhere in this issue.

Forty-sixth Annual Report [of Washington Station], 1936, E. C. Johnson et al. (*Washington Sta. Bul. 342 (1936), pp. 84*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Index to Technical Bulletins Nos. 1–500, M. G. Hunt (*U. S. Dept. Agr., 1937, pp. 249*).—This is a combined subject and author index.

NOTES

Connecticut State Station.—Dr. George P. Clinton, botanist since 1902 and widely known for his many important contributions to plant pathology, retired from administrative work on July 1 to continue his research and to become consulting botanist.

Kentucky Station.—The resignations are noted of C. J. Bradley, assistant in rural finance; W. K. Hall, assistant chemist; and Ruth McDonald, technician. Recent appointments include Drs. B. J. Errington as pathologist and D. W. Bruner as assistant bacteriologist in the department of animal pathology; Dr. W. S. Hodgkiss, Dr. J. H. Bywaters, Stephen Diachun, and E. J. Nesius as assistants, respectively, in chemistry, animal husbandry, plant pathology, and farm management; and J. J. Rosenberg as microscopist.

Mississippi Station.—Dr. Clarence Dorman, assistant director in charge of research and chief agronomist, has assumed the duties of assistant director of experiment stations formerly assigned to W. R. Perkins. In the substations, E. B. Ferris, extension agronomist, has succeeded the late C. T. Ames as superintendent at Holly Springs, and H. C. McNamara, superintendent of the U. S. Cotton Field Station at Greenville, Tex., has succeeded W. E. Ayres as superintendent at Stoneville.

North Carolina Station.—The 1937 North Carolina Legislature appropriated $5,000 for apple research work in the Brushy Mountains of the State—an area including some four or five counties in and around Wilkes County. Plans are now under way for constructing a field laboratory in cooperation with the Brushy Mountain Fruit Growers Association. The research work will be under the direction of the horticultural department of the station with the cooperation of the departments of entomology and of plant pathology.

The station is planning a study of farmers' mutual fire insurance companies in North Carolina. An effort will be made, if the project is carried out, to secure records on the management, methods of operation, risks, and reserves of these companies for the purpose of setting up a better form of management and possibly secure the consolidation of operations.

Station workers are presenting brief accounts of their research programs to county agents and other extension workers during a 3-week period at the college this summer.

Pennsylvania College and Station.—The retirement on July 1 is noted of Frank D. Gardner, head of the department of agronomy for 29 years, and J. A. Ferguson, head of the department of forestry for 27 years. Dr. A. L. Patrick, professor of soil technology and soil technologist, resigned June 30 to become associated with the U. S. D. A. Soil Conservation Service.

L. Chester Marston, Jr., recently appointed assistant professor of entomology, died June 21, aged 32 years. A native of Massachusetts, he was graduated from the Massachusetts College in 1928 and received the M. S. degree from the University of Tennessee in 1929. He had been associated with entomological work at the Universities of Delaware and Toronto and was instructor in entomology at the University of Tennessee from 1932 to 1937.

EXPERIMENT STATION RECORD

VOL. 77 | OCTOBER 1937 | NO. 4

THE AGRICULTURAL EXPERIMENT STATIONS IN 1936

According to a report just issued by the Office of Experiment Stations, "the year 1936 represented an epoch in the history of the agricultural experiment stations." Its outstanding event was "the successful inauguration of a program of effective research under the Bankhead-Jones Act, approved June 29, 1935, which materially increased the Federal funds available for station work and the extension of coordinated and cooperative agricultural research on a scale never before attempted." The report, dealing with the work and expenditures of the stations for the fiscal year ended June 30, 1936, appropriately gives much prominence to the Bankhead-Jones activities. It also, however, in much the same way as in former years treats of the use of $4,395,000 of other Federal funds provided for the support of these stations in the several States, Alaska, Hawaii, and Puerto Rico. It gives the customary general survey of the work of these stations as a whole, discusses their organization, administration, personnel, research facilities, needs, trends, and public service, and reviews the progress made in coordinating their work with that of the U. S. Department of Agriculture and other agencies.

The total income of the stations for the year from all sources was $16,425,489.71. This was an increase of $1,353,228, or 8.2 percent, over the previous year and was the highest since 1932. However, it was still $1,630,793 below the high-water mark of 1931 and approximately the same as for 1929.

The Federal appropriations to the States under the Hatch, Adams, and Purnell Acts were maintained in full, and the initial payments under the Bankhead-Jones Act totaled $600,000. The income from non-Federal sources, $11,361,178, was about 69 percent of the total and approximately 7 percent more than that for the preceding year. Of the 53 experiment stations, 40 reported gains from these sources, and in only 1 of the 13 stations reporting reductions were the decreases very significant. The increases in income resulted from net gains of $559,283 in State appropriations and allotments, $134,301 in balances carried over from the previous year, $126,375 in fees,

and $74,598 in sales receipts, but these were offset to the extent of $148,705 by decreases in miscellaneous income. During the year many of the stations continued to be benefited also from the expenditure of emergency funds for repairs and improvements of station equipment and from allotments by the Department of Agriculture for cooperative work with the stations.

It will be recalled that unlike the earlier Federal grants, which are apportioned equally among the States, the Bankhead-Jones allotments are made on a basis of rural population. This of course resulted in great variations among the States, the extremes ranging from $559.12 for Alaska and $565.96 for Rhode Island to $33,672.38 for Pennsylvania and $37,341.19 for Texas. Another innovation of the legislation is its requirement of equivalent offset funds from other than Federal sources. Since the ratio of all Federal to non-Federal funds for the year was 1:2.25, these requirements were readily attainable for the stations as a whole. In certain individual States, however, the ratio was much below this average, and while sufficient in all cases for compliance in 1936, warning is given that as the Bankhead-Jones funds increase in later years there may be some shortages unless additional income from State sources is provided.

The year was productive of considerable improvement of equipment and facilities for research. Expenditures for additions to equipment aggregated $1,781,321 as compared with $1,062,257 in 1935, an increase of over 67 percent. Few major structures were built, but in many cases additional land, greenhouses, laboratories, barns, and other accessories were acquired. Provision for libraries rose from $48,486 to $53,999.

Although the expenditure for publications increased from $253,926 to $257,024, the number of publications in the regular series decreased from 864 to 770. On the other hand, there was a material increase (from 1,778 to 2,665) in the number of articles contributed to outside journals. These articles were distributed among 100 such journals. Thirty-four stations contributed or collaborated in 83 articles published in the *Journal of Agricultural Research*, as compared with 69 articles from 30 stations in the previous year. According to the report, there was "continued and renewed evidence of a growing purpose to make the results of station investigations more widely and readily understood and applied."

With the inauguration of work under the Bankhead-Jones Act, research projects and programs were extended to a wider field of activity than ever before. In all, 7,223 projects were active during the year, providing for research in almost every phase of agriculture and rural life.

The largest number of Purnell projects continued to be in the field of agricultural economics, 360 with an estimated expenditure of $684,763. Other subjects in which there were a relatively large number of such projects were animal production 240, home economics and horticulture 141 each, entomology 133, field crops 124, and plant pathology 103. In accord with the tendency and the major objective of the plan for expending the Bankhead-Jones funds, 87 or 24 percent, of these projects were conducted in cooperation with Federal or State agencies.

A total of 360 Bankhead-Jones projects were agreed upon and approved. Approximately one-sixth of the funds was allotted to some 42 projects in agricultural economics concerned with adjustment in production by regions and type-of-farming areas better to meet changing economic conditions, marketing agricultural products including methods and practices, and soil and water conservation and land use. Another one-sixth was assigned to some 60 projects relating to animal production, mainly in the fields of nutrition of the larger animals and poultry, dealing largely with vitamins and mineral nutrition and mostly of fundamental character and broad application. Another line of research receiving the relatively large allotment of about $68,000 was that dealing with farm pastures and ranges, much of which was coordinated and carried on cooperatively with the Department of Agriculture. About $62,000 was allotted to projects on breeding and production of field crops, particularly those concerned with plant genetics and breeding for improved quality and varieties, and approximately $40,000 was assigned to projects in animal genetics.

As usual, the stations worked closely with other State agencies, with local organized groups, with each other in regional groups, and with the Department individually and in regional and national groups in efforts to plan and coordinate their research. In addition to many informal cooperative agreements, some of them of major importance, a total of 818 new or revised formal agreements between bureaus of the Department and stations were proposed. These agreements covered 731 major research undertakings and included all the State experiment stations and all but one of the Department's research bureaus. Seven stations participated formally in the special research program undertaken by the Department from its allotment under the Bankhead-Jones Act (E. S. R., 73, p. 291), and a much larger number in the work of the Bankhead-Jones regional laboratories as previously noted (E. S. R., 75, p. 1).

The increasing trend toward voluntary coordination of effort among research workers on problems of wide importance is shown in the establishment of the Tobacco Disease Council and the Cotton Disease Council, each embracing all interested workers in the States

concerned and in the Department of Agriculture. Conferences were held, arrangements were made for mutual assistance, a future program was developed, and exchange of research outlines, annual reviews of progress, and further group planning were provided for. In a similar way, horticulturists, entomologists, and plant pathologists at the Maryland, Pennsylvania, Virginia, and West Virginia Stations established a combined four-State attack on the orchard spray injury problem. A number of other promising group programs were launched during the year.

Certain regional and national cooperative and research undertakings that had been started on an emergency basis as parts of the national recovery program in 1934 and 1935 were modified and expended to meet more permanent requirements. These studies brought more closely together the parallel interests of plant and soil science research and those of crop and animal production research, with more thorough consideration of their economic and social influences. Studies of adjustments in farming by regions and type-of-farming areas from the standpoint of national agricultural adjustment received considerable attention in this connection, and were typical of the renewed and expanded efforts in cooperative research. It is stated that it was not uncommon to find from 5 to 10 subject-matter departments in a station actively engaged in coordinating their studies to meet both State needs and national adjustment programs.

Following a discussion of group accomplishments and programs, the greater part of the report is again devoted to a review of recent station work, prepared by specialists of the Office from current publications of the stations and communications from station directors and from other authoritative sources. This review is necessarily selective rather than a complete summary of all accomplishments of the stations as a whole or individually, but it is believed to be fairly representative and to indicate especially that the work of the stations "is of value to urban, as well as rural people, and in line with national, as well as local, recovery and adjustment policies." An innovation in the assembling of this material is the inclusion of a detailed subject index. This should measurably increase the usefulness of a publication which is being more and more looked to as an indicator of what the stations are attempting to do and the progress which is being made.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A method of preparing paraffin sections of bone, L. T. David (*Science, 82 (1935), No. 2121, p. 179*).—The author of this contribution from the [Connecticut] Storrs Experiment Station successfully treated pieces of bone as large as 2 by 2.5 cm and by 2 mm thick in accordance with the following schedule:

Decalcification in 5 or 10 percent nitric acid, followed by treatment with 5 percent sodium sulfate solution (24 hr.) and running water (24 hr.); dehydration; clearing with equal volumes of absolute alcohol and chloroform, followed by two changes of chloroform; several changes of soft paraffin (m. p. 47° to 49° C.); and embedding in hard paraffin (m. p. 56° to 58°).

Sections cut at 10μ were mounted by means of a fixative containing 1 cc of standard water-glass solution and 1 cc of concentrated ammonia solution in 100 cc of water. This fixative did not interfere with staining, whereas the gum arabic and potassium bichromate fixative did interfere. "Haemalum" and eosin gave a satisfactory staining.

Rapid weighings with a Troemner solution balance, E. T. Bartholomew and E. C. Raby (*Science, 82 (1935), No. 2133, p. 468, fig. 1*).—At the University of California, "to avoid the inconvenient, tiresome, and time-consuming method of getting the eye on a level with the pointer end of the beam in order to make a correct reading, two very simple, but very satisfactory, additions were made to the balance. The two additions consist of a damper . . . and two white strips attached to the adjacent projections on the swinging and stationary beams."

The construction of the damper, a very simple device, is described and shown in a drawing. Objects weighing 15 or more kilograms were quickly weighed to an accuracy of 1 g.

[Researches in bacteriological chemistry by the Wisconsin Station] (*Wisconsin Sta. Bul. 438 (1937), pp. 145, 146, 147, 148*).—Recent work by the station is summarized under the following captions: Research casts light on problems in yeast manufacture, by D. Colingsworth, E. C. Saudek, and I. L. Baldwin; and factors affecting nodule formation in legumes, by J. J. Reid and Baldwin.

Some quantitative relationships in bacterial population cycles, M. W. Jennison (*Jour. Bact., 30 (1935), No. 6, pp. 603–623, figs. 7*).—It has been shown that "curves of bacterial population cycles are sigmoid but are not symmetrical about their point of inflection. The presence or absence of a lag period in subcultures at the same temperature, with bacteria whose optimum is about 37° C. but which are being cultivated at 22°, seems to be dependent, other conditions being equal, upon factors other than the age of the inoculum." A number of other quantitative observations are recorded.

A comparative study of several strains of the so-called radiobacter, F. B. Smith and P. E. Brown (*Iowa State Col. Jour. Sci., 10 (1935), No. 1, pp. 17–25, fig. 1*).—At the Iowa Experiment Station 8 strains of *Bacillus radiobacter* were secured from various laboratories in the United States, and 16 were isolated

from Iowa soils. Studies on the morphological, cultural, and physiological characteristics were made. "No differences great enough to differentiate species were obtained, and it was concluded that all cultures represent a single species."

The production of furfural from xylose solutions by means of hydrochloric acid-sodium chloride systems, E. I. Fulmer, L. M. Christensen, R. M. Hixon, and R. L. Foster (*Jour. Phys. Chem., 40 (1936), No. 1, pp. 133–141*).—The authors of this contribution from the Iowa State College report on the production of furfural from strong xylose solutions using hydrochloric acid-sodium chloride solutions as dehydrating agents.

"The xylose-hydrochloric acid-sodium chloride systems were refluxed, at atmospheric pressure, with toluene. The furfural yield was determined from the specific gravities of the resulting furfural-toluene solutions. The concentrations of hydrochloric acid used were 0.25, 0.5, 0.75, 1, 1.5, and 2 N, each in the presence of 0, 5, 10, 15, 20, 25, 30, 35, 40, and 45 percent sodium chloride. The yield of furfural was twice as great for 4 percent xylose as for 60 percent xylose. Detailed experiments were performed for xylose at 20 percent concentration for which the yield in furfural is about 20 percent less than for 4 percent xylose. The yield of furfural is increased about one-third for each 5 percent addition of sodium chloride up to a furfural yield of about 22 percent. From this point the increase in yield is less. For all cases, for a given time period, the yield of furfural is, within reasonable limits, dependent only upon the pH of the hydrochloric acid-sodium chloride combinations. That is, the yield is dependent upon the thermodynamic degree of dissociation of the acid (the activity coefficient)."

The similarity between the mechanism of the rennin and pectase (pectinmethoxylase) reactions, A. C. Dahlberg and Z. I. Kertesz (*Science, 83 (1936), No. 2142, p. 56*).—The authors of this contribution from the New York State Experiment Station call attention to the striking resemblance between the reaction of the coagulation of milk by rennin and the formation of a gel from pectin under the influence of pectase. In part it is noted that "in both cases the enzyme causes a slight degradation of the molecule, which also is the first step in the enzymic decomposition of the substrates. In the absence of calcium (Sr, Ba, etc.) no visual evidence of the enzyme action occurs. In the presence of or upon the addition of calcium, however, the paracasein in milk and pectic acid produced from pectin both form insoluble salts, and a coagulum or gel appears."

A quantitative method for the assay of vitamin D with chickens, O. N. Massengale and C. E. Bills (*Jour. Nutr., 12 (1936), No. 5, pp. 429–446, figs. 2*).—A quantitative method is described for the assay of vitamin D with chickens based on the determination of the femur ash, the significance of the ash percentage being interpreted by comparisons with master response curves either for cod-liver oil or irradiated ergosterol. It appears that equivalent rat units from cod-liver oil and from irradiated ergosterol for chickens are not broadly comparable, their relative efficiency fluctuating widely with varying degrees of calcification. In feeding tests a diet containing a calcium-phosphorus ratio of 2:1 gave good calcification when containing 18 international units of vitamin D as cod-liver oil per 100 g of ration.

Report of the subcommittee on viscosity, E. G. Bayfield (*Cereal Chem., 12 (1935), No. 5, pp. 532–535*).—In a report prepared at the Ohio Experiment Station, the subcommittee named presents MacMichael viscosimeter data to show the effect of crop origin upon the flour viscosities of the 1933 wheat crop, together with the majority opinion of the subcommittee on various details of the technic of the determination.

On the changes of leucosin, gliadin, and glutenin under the action of flour and yeast proteinases, A. V. Blagoveschenski and M. P. Yurgenson (Cereal Chem., *14* (*1937*), *No. 1, pp. 103–107*).—The authors find that the optimum pH for the action of the natural mixture of proteolytic enzymes of wheat flour extracts on the proteins of wheat gluten are, for leucosin, 3.7 to 4.7; for gliadin, 3.7; and for glutenin, 4.9 to 5.3; that the optimum pH for the action of the natural mixture of proteolytic enzymes of yeast extracts on leucosin is 3.7 to 4.7; on gliadin, 3.7; and on glutenin, 4.9 to 5.3; that the optimum pH values for the action of pure wheat flour proteinase on gliadin and glutenin are identical and equal to from 4.9 to 5.0; and that the optimum pH for the action of pure yeast proteinase on gliadin and glutenin is also the same and equals 3.3 to 4.9.

The splitting of glutenin was found to be less than the splitting of leucosin and of gliadin. It was also shown that the action of pure flour and yeast proteinases is disaggregating rather than proteolytic, since it is accompanied only by insignificantly small increases in amino nitrogen.

The effect of milk solids on fermentation reactions, O. Skovholt and C. H. Bailey (*Cereal Chem.*, *14* (*1937*), *No. 1, pp. 108–120, figs. 3*).—It has been shown at the Minnesota Experiment Station that "proteolytic activity in doughs is not affected by milk solids as judged by applications previously made of available methods, though it is believed that such methods may not measure adequately all types of attacks that proteases may make on the protein complex.

"Diastatic activity in doughs is retarded by the introduction of milk solids due to the effected reduction in H-ion concentration.

"Gas production from fermenting doughs is accelerated by milk solids if sufficient sugar is available. From sugar-deficient doughs made with ordinary commercial flours, milk solids effect a reduction in amount of gas produced due to a retarding effect on diastasis. With certain experimentally milled flours this retarding effect is not in evidence even in systems low in diastatic activity. Such low diastatic activity may be due to a low starch susceptibility to diastase attack not adversely affected by addition of milk solids."

The use in doughs of yeast treated to inhibit growth gave results indicating that milk solids increase the activity of the yzmase complex. This activation of zymase by milk solids appeared to be due partially to reduction in H-ion concentration. Other stimulating effects of milk solids upon fermentation by zymase from yeast were also noted.

The wheat meal time fermentation test, C. O. Swanson and J. H. Parker (*Northwest. Miller*, *184* (*1935*), *No. 2, Sect. 2, pp. 14–16*).—This brief discussion from the Kansas Experiment Station takes up both the meal and the flour varieties of the time fermentation test from the viewpoint of the breeder who wishes a quick flour strength test applicable to very small wheat samples.

"The 'wheat meal time fermentation test' meets the demands for simplicity. The question of reliability is yet open for discussion. As far as the test has been used, it will definitely separate the 'strong' from the 'weak' wheats. However, when it is attempted to differentiate among those on the border line, the test falls far short of being reliable."

Definition and measurement of "flour strength" as an inherent property of wheat, M. J. Blish and R. M. Sandstedt (*Cereal Chem.*, *12* (*1935*), *No. 6, pp. 653–664, figs. 3*).—The authors of this contribution from the Nebraska Experiment Station found that wheats of equal protein content have essentially the same baking potentialities in terms of loaf volume even though they do not all respond equally to any single baking formula and procedure. "Therefore,

for all practical purposes, protein content and inherent flour strength are one and the same thing. The only exceptions to this are to be found in wheats that fail to register responses proportional to their protein contents when subjected to any treatments, singly or combined, that are nowadays at the convenient disposal of both miller and baker. Applying these criteria in our supplementary baking procedures, it will be found that such wheats are rarely, if ever, to be encountered among our established American wheat varieties intended for commercial bread production.

"'Strength', as an inherent property, is to be determined not by the baking test but by the protein test. The essential purpose of the baking test is to measure a flour's response to single and combined treatments and environments that are likely to be accorded to it under modern industrial conditions. All possible combinations should be tried, if necessary." With respect to the properties here discussed, "wheats may conveniently be classified into three, or at the most four, groups, with one of these groups predominating."

The baking strength of flour, M. J. Blish (*Northwest. Miller, 184 (1935), No. 10, pp. 817, 834, 835*).—This paper, from the Nebraska Experiment Station, is "an address before students of the American Institute of Baking."

Refractometric methods of determining diastatic activity of flour, E. Munz and C. H. Bailey (*Cereal Chem., 14 (1937), No. 1, pp. 85–96, figs. 7*).—A comparative study carried out at the Minnesota Experiment Station showed that flour: water ratios in the range of 1:4 to 1:6 were best adapted to the refractometric method for the measurement of the autolytic hydrolysis of wheat flour. The ratio of maltose content: n_D of the digests became narrower when the flour: water ratio was greater than 1:6. Salts added in the form of citrate buffer solutions apparently reduced the rate of increasing n_D of digests below the rate at equivalent pH levels obtained by adding lactic acid solutions, but buffering materials contributed by low grade flours did not affect the n_D values appreciably. Temperature of digestion of flour suspensions in water influences the maltose: n_D ratio. A linear ratio is approached when the flour suspensions are incubated at 62° to 63° C. At higher temperatures there is a substantial departure from linearity, the n_D increasing faster than the maltose content.

Variability of replicated measurements of n_D was computed in the instance of several series in which variables in the technics were progressively modified. This gave a basis for selection of one technic which provided adequate and convenient chemical and physical conditions and at the same time was least variable. This technic, when applied to duplicated measurements of autolytic hydrolysis in the instance of 10 different flours, resulted in good agreement between the duplicates.

A collaborative study of the Blish-Sandstedt, Schoorl, and Bertrand methods for determining reducing sugars in flour diastatic activity measurements, C. F. Davis (*Cereal Chem., 14 (1937), No. 1, pp. 74–85, fig. 1*).—The more important findings in this comparison of well-known methods were as follows:

"The Blish-Sandstedt, Schoorl, and Bertrand methods for measuring the reducing sugars after diastasis in the diastatic activity test of flour are about equally satisfactory. A slight adjustment in the tables of these three methods in the higher sugar levels would make the values more comparative. The merits of the three methods as indicated by the analysis of the data from this collaborative study would rate them for general use as follows: (1) Schoorl, (2) Blish-Sandstedt, and (3) Bertrand. Because of the greater uniformity between laboratories and a greater differentiation between flours, the Schoorl method is preferable even though it has a higher experimental error than the Blish-Sandstedt method. . . .

"Most collaborators preferred the Blish-Sandstedt method because the ferricyanide reduction in a boiling bath was relatively simple and the experimental error was low."

Atmospheric factors in milling: Principles which make possible the establishment of any desired relative humidity, C. O. Swanson and J. E. Anderson (*Northwest. Miller, 183* (*1935*), *No. 9, pp. 798, 804*).—In this semi-popular note from the Kansas State College "the attempt is made to present some of the principles which make it possible to control or maintain any desired relative humidity. It is not attempted to give specific directions. These must be given by competent engineers and in reference to the conditions in the individual mill concerned. All that will be attempted is to set forth some of the facts to help the millers understand the problem involved." Elementary heat and moisture relations in air are briefly outlined.

The determination of moisture in wheat and wheat products, J. E. Anderson (*Northwest. Miller, 184* (*1935*), *No. 2, Sect. 2, pp. 25, 28*).—The author of this contribution from the Kansas State College outlines the special features and the difficulties of moisture determination, and reports that "to overcome the slow rate of heating the samples and the nonuniformity of heating, a steam radiator was constructed and placed inside the vacuum chamber. The radiator was constructed of flat sections which served as shelves on which the samples were placed. The steam was supplied from an electrically heated boiler in which the temperature was regulated by pressure-operated control switch. It was found that with the use of the steam shelves all samples were heated at a uniform rate, and that only 10 minutes' time was required to heat the samples to the temperature of the oven. It was also found that 4 to 6 hr. were required to dry to constant weight, and that duplicate samples agreed within 0.05 percent. The procedure prescribed by the Official method was followed in leaving the lids on the dishes when placed in the oven. . . .

"The determinations as often made with the ordinary vacuum oven and procedure are not sufficiently accurate to be considered a standard with which other methods may be compared. Results which have been obtained by our modified method show a better correlation between the electrical determination and the vacuum-oven moisture determinations. It appears that the electrical method has been criticized because of a faulty operation of the vacuum oven."

Some observations on methods of ashing cereal products, L. H. Bailey (*Cereal Chem., 14* (*1937*), *No. 1, pp. 120–128*).—At the U. S. D. A. Bureau of Chemistry and Soils, the author has prepared a review of previous work; and has compared the use of the nitrates of lanthanum, cerium, thorium, and yttrium with the supplementary use of alcohol and glycerine, with the magnesium acetate method, and with the A. O. A. C. method.

"The method found most satisfactory was a modification of the magnesium acetate method. When 3 g of flour (either wheat or rye) is moistened with 3 cc of an alcoholic solution of magnesium acetate equivalent to a blank of 5 mg MgO (6 g of the anhydrous salt per liter), and incinerated in a muffle furnace at 700° C., a white fluffy ash is obtained in approximately ¾ hr. In the case of bran, using a 2-g sample, 3 times the amount of magnesium acetate solution must be used and ashing continued for 1½ hr. The results duplicate those of the official A. O. A. C. method."

Detection of sulfur dioxide in flour, L. Reimers (*Cereal Chem., 14* (*1937*), *No. 1, pp. 129, 130*).—When the presence of sulfur dioxide has been suspected in the preparation of the dough, to which it gives "a soft, inelastic character much resembling a slightly stiff cake batter", in order to confirm the presence of the impurity "slick the suspected sample alongside of a standard, which is known to be free from this gas, just as in the . . . slick test. Instead of using

water, dip the slick in a potassium iodide-starch solution. . . . This wetted slick is now passed carefully through air containing a light concentration of chlorine gas and the liberated iodine will give a light purple coloration to the slick. Care must be exercised not to overtreat with chlorine gas, as in such case too much iodine will be set free for the quantity of sulfur dioxide present. It should not be found difficult to secure a light coloration with proper care. Within a few minutes the sulfur dioxide, if present, will have diffused to the iodine and reduced it to the colorless iodide. The standard will remain colored, whereas the sulfur dioxide contaminated sample will fade out to a normal color. If sulfur dioxide was present, the contrast on the slick will be very marked."

The selenium and cystine content of some partial hydrolysis products of gluten from toxic wheat, D. B. Jones, M. J. Horn, and C. E. F. Gersdorff (*Cereal Chem., 14 (1937), No. 1, pp. 130–134*).—In an investigation carried out at the U. S. D. A. Bureau of Chemistry and Soils, "gluten prepared from toxic wheat grown on seleniferous soil was digested for 3 hr. by pepsin. Four fractions of partial hydrolysis products of the protein were separated. Fraction A (2.5 g) was free from both selenium and cystine. Fraction C (1 g) was also devoid of selenium and contained only a trace of cystine. Fraction B (9 g), representing in weight 11.5 percent of the gluten used, contained 58 percent of the total selenium and 10.5 percent of the total cystine. By removing the dicarboxylic amino acids from Fraction B, the residual part of the fraction contained 1,178 p. p. m. selenium.

"The results show (*a*) that over half of the selenium in the toxic gluten can be concentrated in a small partial hydrolysis fraction, (*b*) an interesting relation in the distribution of selenium and cystine in the hydrolysis products. They also contribute further evidence that the selenium in toxic wheat is combined with the protein."

Quantitative determination of lactic acid in butter, H. C. Troy and P. F. Sharp (*[New York] Cornell Sta. Mem. 202 (1937), pp. 17*).—Three methods for the determination of lactic acid in butter were compared. These methods all depend on the oxidation of lactic acid to acetaldehyde, the removal of the acetaldehyde from the oxidation mixture, the collection of the acetaldehyde in sodium bisulfite solution, and the titration of the bound bisulfite with iodine, but differ in the amount of time required and the completeness of the removal of interfering substances.

Method 1, the Troy and Sharp extraction method (E. S. R., 74, p. 5) is "accurate, sensitive, and reliable, but the extraction is tedious and time consuming." Method 2, the Whittier and Trimble direct-oxidation method (E. S. R., 75, p. 396) is "the shortest and involves the fewest steps, but the results are somewhat uncertain and are not sufficiently reliable for detecting the small amounts of lactic acid which may be present in butter purported to be 'sweet-cream' butter. The oxidation-distillation procedure cannot be used when the butter is added to the oxidation flask."

Method 3 is the direct-precipitation method of Friedemann, Cotonio, and Shaffer (E. S. R., 58, p. 114). In this method, "25 g of butter is added directly to the precipitation flask, and the precipitation with copper hydroxide is carried out as with any other milk product except that a correction is made for the volume occupied by the fat. This method is essentially as accurate as, and is much simpler and shorter than, the extraction method. It is nearly as short as the Whittier and Trimble method and is much more reliable. The filtrate may be oxidized by either the aeration or the distillation process. Method 3 is recommended."

The value of a lactic acid determination in the examination of butter is concisely indicated.

Factors influencing dill pickle fermentation, F. W. Fabian (*Canner, 84 (1937), No. 15, p. 16*).—The author presents a very brief semipopular summary of some practical indications obtained in the work of the Michigan Experiment Station (E. S. R., 72, p. 157) on the commercial preparation of this product.

Checking fermentation temperatures, W. V. Cruess (*Wine Rev., 4 (1936), No. 4, p. 16*).—The author of this note from the California Experiment Station calls attention to the inaccuracy of temperature readings taken by withdrawing liquid from the fermenting vat and taking its temperature with an ordinary short-stemmed mercury thermometer outside the vat. He found that readings as much as 5° F. too low were often obtained by this procedure. A dial-type, vapor-tension thermometer having a 6-ft. stem was tested and found to be satisfactory and to be obtainable at a reasonable cost. It is noted, however, that a 4-ft. stem would have been more convenient than one 6 ft. in length.

A method of storing experimental lots of fermented juices, W. V. Cruess (*Fruit Prod. Jour. and Amer. Vinegar Indus., 15 (1935), No. 3, p. 70*).—To avoid the growth of film-forming fungi (E. S. R., 62, p. 504) after head space has been left by removal of samples, the author of this note from the California Experiment Station found the following procedure effective and much more convenient than repeated transfer of residues to smaller containers:

"A layer of neutral oil known as 'confectioner's slab oil' was placed in each jug of fruit wine, the layer being about 0.25 in. thick. As required for analysis, samples were pipetted from beneath the oil or were siphoned off by use of a bent glass tube and short piece of rubber tubing."

Tests on unfortified sweet wines, W. V. Cruess (*Wine Rev., 4 (1936), No. 2, pp. 20, 21, fig. 1*).—This note from the California Experiment Station is a brief discussion of the preparation and the preservation, by pasteurization in sealed containers without the use of any sulfur dioxide, of sweetened wines of low alcoholic content. One of the methods for producing the required sweetness and lowered alcohol concentration was that of adding the sweet grape juice to a dry wine, the product being then bottled and pasteurized.

A note on the spoilage of Muscatel, W. V. Cruess (*Wines and Vines, 17 (1936), No. 6, p. 6*).—The author of this note reports an investigation at the University of California of an acid-forming spoilage organism which was widespread in the 1934 season. "Tourne" bacteria, at first suspected, could not be found; but wild yeasts of a marked acid-forming capacity were found to be very generally distributed on Muscats from the Fresno district.

With respect to the prevention of spoilage by such organisms, the author notes that "our tests show that high temperatures during fermentation favors the wild yeast activity and as is well known discourages the true wine yeast. If this form of spoilage again makes its appearance winemakers can readily prevent the growth of the wild yeasts responsible for it by the use of a moderate dose of metabilsulfite or SO_2." As little as 75 p. p. m. of sulfur dioxide completely inhibited the wild yeasts; and this was also a concentration sufficient to check the lactic acid-producing Tourne bacteria. Pasteurization for control of Tourne is regarded as a little uncertain, but sterilizing filtration has been successfully applied in one large winery. The author points out the need for special care to avoid reinfection in sterilizing by filtration.

Western hemlock bark, an important potential tanning material, C. C. Smoot and R. W. Frey (*U. S. Dept. Agr., Tech. Bul. 566 (1937), pp. 48, pls. 2, figs. 5*).—The authors discuss the technical and economic possibilities of tannin extract prepared from bark now mostly dealt with only as a waste. On the basis of the moisture-free bark, the tannin content of this potential source is somewhat more than 15 percent, but the bark as removed in present practice contains too high a proportion of the wood, which contains little

tannin. Details of plant requirement, costs of raw material and operation, etc., are discussed, and it is concluded, in part, that under present conditions "successful utilization of the bark hinges on a rather narrow working margin of profit. A careful balance must be struck whereby sufficiently attractive prices can be offered for the bark without, however, imposing upon the extract a selling price that is prohibitive. Quick returns and large profits are not to be expected. On the other hand, in view of the tremendous quantities of bark and our large annual consumption of tannin in the making of a basic national commodity, namely, leather, there appears to be an opportunity of establishing a permanent business of large volume."

AGRICULTURAL METEOROLOGY

Moisture and farming in South Africa, W. R. THOMPSON ([*Johannesburg*]: *Cent. News Agency, Ltd., 1936, pp. 260,* [*pls.*] *34*).—This book makes it plain that moisture is unquestionably and in a very special sense the dominant factor in agricultural production in South Africa. "This is particularly true of the crop farmer in the summer rainfall area, who, because of his system of farming and the inefficacy of the rainfall, is very liable to suffer the effects of common droughts."

On the basis of a wealth of data accumulated during many years by the author and others, the book deals at some length with the alleged drying-up of South Africa and the amelioration of the drought problem with special reference to the Schwarz-Kalahari scheme (E. S. R., 44, p. 208).[1] It is stated that "the Schwarz-Kalahari scheme is fantastic and appeals particularly to the layman. In responsible scientific circles it receives no support. . . . It should be viewed solely from the irrigational and not from the climatic standpoint." The author also considers at some length historic evidence in connection with the alleged drying-up of South Africa, holding that "the struggle of the farmer against droughts and an unsatisfactory water supply would appear to be common during the historic period, and is no new disability to farming."

Other chapters of the book deal with secular variations and agricultural aspects of South African rainfall; rainfall intensity with special reference to major trends; rainfall, soil erosion, and run-off; the role of evaporation in the dissipation of moisture; moisture dissipation through transpiration; the role of percolation in the dissipation of moisture; and veld burning.

The author is convinced that secular variations in rainfall exercise a great influence upon the natural vegetation and other allied factors, and that the low level of the Union's rainfall during recent years is without doubt a factor of considerable significance in explaining the hardships endured by the South African farming community. "Rainfall intensity is probably more important in encouraging run-off and soil erosion under the present circumstances of a sparser plant cover in some parts. . . . Bare space and soil erosion go hand in hand." Unused veld was found to prevent run-off and soil erosion almost entirely on a 3.75-percent slope of soil. Kraal manure, when applied to maize, effected a considerable decrease in run-off, thus indicating the importance and effect of organic matter in run-off control. Rhodes grass, representing perennial planted grasses, was very effective in preventing run-off and soil erosion.

Generally speaking, evaporation appears to be the principal dissipating factor of rainfall in South Africa when transpiration is excluded. This is particularly

[1] So. African Jour. Sci., 20 (1923), No. 1, pp. 208–222.

true in the summer rainfall areas. "Evaporation losses in summer are mainly influenced by the distribution and amount of precipitation. It varies from over 0.3 in. after heavy rains to considerably below 0.1 in. in respect of a cultivated (once annually) bare soil surface. . . .

"Maize grown under Pretoria conditions is responsible for the utilization of almost two-thirds of the moisture from rainfall where run-off and percolation are excluded. Translating the data to field conditions, it would seem that on a gentle slope roughly the losses due to transpiration, evaporation, run-off, and percolation are respectively 50 percent, 35 percent, 15 percent, and nil." It is stated that it is likely that losses through evaporation and run-off have increased, and that the percentage of moisture available for percolation has diminished, apart from a decreased rainfall in many cases during more recent years. The need for a comprehensive investigation in this field is emphasized.

Considering the question of veld burning from the ecological, hydrological, and veld managing aspects, the author concludes that "in practice it will be difficult, if not impossible, to abandon burning altogether as a necessary measure in veld management in many areas of the Union. It is strongly urged that in view of the serious moisture limitations in South Africa, veld burning should be practiced very cautiously and only in cases of absolute necessity; where possible it should be eliminated altogether."

Florida's frost problem, E. S. Ellison (*Fla. State Hort. Soc. Proc., 49 (1936), pp. 84–91*).—The essential features of this article have been noted from another source (E. S. R., 77, p. 12). It especially emphasizes the importance of frost forecasting and protection and the accumulation of local data and experience.

Weather review (*[Connecticut] Storrs Sta. Bul. 214 (1937), pp. 23–27*).—Data on temperature, precipitation, and length of growing season at Storrs during the 49 years 1888–1936 are summarized.

The mean annual temperature during that period was 47.4° F., the highest 100° June 3, 1921, the lowest −21° February 9, 1934. The greatest daily range was 51° May 6, 1931. The mean annual precipitation was 43.52 in., the greatest 66.51 in. in 1901, the least 30.99 in. in 1930. The longest period with no precipitation was 42 days, January 4 to February 14, 1919. The longest growing season was 190 days, the shortest 131 days. The average date of last killing frost in spring was May 3, first in autumn October 9. The prevailing direction of wind for the greater part of the year was northwest, during June and July southwest.

SOILS—FERTILIZERS

General trends of the Desert type of soil formation, C. C. Nikiforoff (*Soil Sci., 43 (1937), No. 2, pp. 105–131, pls. 3*).—This analysis of the factors involved in desert pedogenesis is a contribution from the U. S. D. A. Bureau of Chemistry and Soils. It is largely based upon a study of the Mojave Desert and a part of the Colorado Desert.

"As a consequence of an extreme reduction of the constructive activity of the biosphere, the Desert type of soil formation is dominated by a direct influence of the climatic agencies. These, in turn, are dominated by the temperature, because of the restricted amount of rainfall, which reduces the constructive power of the meteoric moisture so far as the development of a normal soil profile is concerned." The Desert type of soil formation is predominantly thermogenic and abiotic.

"An evolution of the normal profile of the Desert soils is effected by an upward capillary movement of the underground moisture and by a concentration of the chemical decomposition of its mineral skeleton at some depth from the surface. The first process leads to the formation of the desert crusts at some distance from the soil surface, and the second is responsible for a development of the clay pan horizon. A cementation of the crust can be produced by different salts or compounds which may occur in the rising solutions, and the crusts are formed wherever the compounds capable of causing cementation are present in the solution. The clay pan formation in the Desert soils is a result of a hydrolytic decomposition in situ of certain minerals, mainly feldspars and hornblende, and of a subsequent dehydration of the products of hydrolysis. This process does not take place on the immediate surface in the desert environment but proceeds at some depth from the surface.

"The development of these two processes can coexist in any particular Desert soil, developing their relative intensity by the alternating waves according to the changes of the climatic seasons. Their products not infrequently overlap each other in the soil profile. In either case, a certain part of the surface soil remains practically unaffected by the corresponding developments. This section of the soil profile may be regarded as a passive, or dead, horizon, in which soil moisture undergoes rapid and easy vaporization by the desert heat. The compounds which may be brought up in the rising solutions and the accumulation of which indurates the crust do not enter the dead horizon and do not reach the surface of the soil because of vaporization of the solvent as soon as it reaches the lower limit of this zone. Because of a deficiency of moisture caused by rapid vaporization of the water which may be supplied by rainfall, hydrolytic activity does not develop in the dead horizon. The upper limit of an effective chemical decomposition of the mineral skeleton, however, seems to be somewhat closer to the surface than the upper limit of precipitation of the crust-cementing compounds. Moreover, a coexistence of the two processes apparently tends to reduce the depressing influence of the dead horizon and consequently to reduce its thickness. An average and normal thickness of the dead horizon of the Desert soils is not certain. In many instances it is mechanically reduced by wind erosion or by the destructive run-off, whereas in many other cases it is greatly enlarged by a deposition of fresh strata of drifts dropped by the same agencies after the crust or a clay pan was formed. Because of a mechanical modification, its thickness varies from just a few inches to considerably more than 10 ft. The average normal thickness, however, is not far from 1 or 1.5 ft."

[Soil Survey Reports, 1932 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1932, Nos. 14, pp. 52, pls. 2, figs. 4, map 1; 15, pp. 70, figs. 2, map 1; 16, pp. 40, figs. 2, map 1*).—The reports here noted were prepared with the respective cooperation of the California Experiment Station, the [New York] Cornell Station, and the University of Nebraska State Soil Survey.

No. 14. *Soil survey of the Lodi area, California*, S. W. Cosby and E. J. Carpenter.—The Lodi area occupies 333,440 acres in north-central California. The area has the three topographic features of foothill lands, broad valley plain, and delta lands. Drainage conditions are varied.

This report records 18 series inclusive of 25 types. Hanford sandy loam is the most extensive of the soils listed, with 15.3 percent of the area.

No. 15. *Soil survey of Rensselaer County, New York*, W. J. Latimer et al.—Rensselaer County, eastern New York State, possesses an area of 416,640 acres of low plateau lands. Drainage is effected through the Hudson River system.

The soils examined were found to consist of 31 series inclusive of 45 types,

with 11.1 percent rough stony land and rock outcrop, and 7.8 percent Nassau shale loam.

No. 16. *Soil survey of Rock County, Nebraska*, W. D. Lee et al.—Rock County lies in north-central Nebraska, occupying 638,720 acres of tablelands, prairie plains, and sand-hill lands. Drainage is provided, in part, by the Niobrara, Elkhorn, and Calamus Rivers and by a number of tributary creeks.

Valentine sand occupies 33.9 percent of the area surveyed, Cass loamy fine sand covers 8.3 percent, and dune sand 33.2 percent. In all, 13 series represented by 24 types were found. Of these soils 12 are classed as grain-farming soils, 7 as grazing, and 8 as hay-farming soils.

[Soil Survey Reports, 1933 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1933, Nos. 3, pp. 30, figs. 2, map 1; 4, pp. 36, figs. 2, map 1*).—These surveys were carried out with the respective cooperation of the Texas Experiment Station and the Nebraska State Soil Survey.

No. 3. *Soil survey of Cass County, Texas*, M. W. Beck et al.—Cass County consists of 608,640 acres in the northeastern corner of Texas. "The relief is that of an intricately and deeply cut plain, and the land ranges from gently rolling to very rolling." Drainage conditions are varied. "Practically all the soils developed from alluvium, which comprise nearly one-sixth of the total area of the county, are very low and flat, with poor or moderately good drainage." The upland soils are, in general, better drained.

The soils surveyed are here listed as 15 series, including 17 types. Kirvin fine sandy loam, of which nearly one-half is a stony phase, takes up 24.8 percent of the county, Ruston fine sandy loam 26.2, Bowie fine sandy loam 20.5, and Bibb fine sandy loam, none of which is under cultivation, forms 10.4 percent.

No. 4. *Soil survey of Greeley County, Nebraska*, S. R. Bacon et al.—Greeley County possesses an area of 365,440 acres in east-central Nebraska. "The area included in this county is part of a formerly nearly level or rolling plain, on which minor relief has been produced by stream erosion and wind action. . . . All the county is well drained except some of the lower-lying first bottoms, that are frequently inundated, and a few small basinlike depressions scattered over the nearly level tableland." Colby silt loam occupies 29.3 percent of the area surveyed, Holdrege silt loam 23.1, and dune sand (of no value for tillage) 10.6 percent.

Studies on soils of the rice area, M. B. Sturgis and J. F. Reed (*Louisiana Sta., Rice Sta. Bien. Rpt. 1935–36, pp. 14–16*).—A brief general report is made on rice soil studies, including plant-food content, exchangeable bases, accumulation of soluble salts and alkalinity, suitable fertilizers, effects of arsenate residues, etc.

[Soil chemistry and soil fertility researches by the New Jersey Stations] (*New Jersey Stas. Rpt. 1936, pp. 97–102, 103, 104*).—These pages deal briefly with fertilizer and lime studies; phosphate adsorption and displacement; value of organic matter; base-exchange and lysimeter studies; soil microbiological complexes and methods of studying them; the mechanism of decomposition of organic matter in the soil and the processes contributing to the formation of soil "humus"; reciprocal influences of plants and micro-organisms of the soil; autotrophic bacteria, their physiology and role in soil processes; and marine bacteria and their role in the cycle of life in the sea.

[Soil and erosion investigations of the Wisconsin Station] (*Wisconsin Sta. Bul. 438 (1937), pp. 27–35, 87, 88, 88–93, 97, 98, figs. 7*).—A number of the station's soil investigations are summarized under the following captions: Factors affecting erosion measured by La Crosse Station, by O. E. Hays and V. J. Palmer; soil conditions determine success in growing forest nursery stock,

by S. A. Wilde, H. M. Galloway, and H. H. Hull; the use of the exposuremeter in soil analysis, by Wilde; Marshfield trials show effects of fertilizer on farm crops, and lime and phosphate boost alfalfa yields on Colby and Marathon silt loam soils, both by F. L. Musbach; and improved procedure facilitates removal of colloids from soil samples, by E. Truog, J. R. Taylor, Jr., R. W. Pearson, and M. E. Weeks.

The "chemical analysis" of the soil, E. A. Mitscherlich (*Soil Sci., 43 (1937), No. 4, pp. 253–255*).—The author discusses the present situation with regard to estimations of the liming and nutrient requirements of soils.

"For the nitrogen content, especially the nitrogen requirements, field experiments offer the best and most reliable information. For the lime requirements of the soil, a simple reaction determination is sufficient. The P and K requirements of the soil are difficult to determine for the following reasons: Field experiments are not sufficient because of the high activity factor of these nutrients, and the so-called chemical methods are not as yet efficient. In field experiments it often happens that during the season of fertilizer additions no increase in yield takes place; but if no additions of nutrients were made, the yield would drop the following year. It often happens that the quantity of nutrients in the soil is sufficient to produce a maximum crop the year of the experiment. The nutrients may, however, be exhausted the year following. In laboratory experiments we fail to bring into solution those elements which might be utilized by the next year's crop. If we were able to bring these nutrients into solution such analyses would present no difficulties.

"Field experiments are the standard. Soil analyses are important for the evaluation of cultivated land, and they are important for the farmer who is looking for advice about fertilizers. The field experiment, however, as pointed out, fails under certain conditions. To obtain reliable results, it is necessary to decrease the nutrient content of the soil to a very low level. This may be accomplished either by using a shallow layer of soil, thus decreasing the quantity of soil which actually supplies the nutrients to the plants, or by 'diluting' the soil with sand, free of nutrients."

Summarizing his analysis of the soil-testing problem, the author concludes: "The question may be asked, Why do we need chemical or laboratory methods and why should we not limit ourselves to pot experiments? The answer is that in the case of pot experiments the time element is a factor which causes excessive expense. Also, it is necessary to test countless numbers of soils, which necessitates a cheaper and more rapid method. . . .

"It is hoped that the International researches will furnish reliable results in perhaps 80 percent of all cases. . . . Applying laboratory methods it would be possible to investigate in Eastern Prussia 10,000 soils annually, instead of the 2,000 which now are examined, involving the use of 20,000 culture vessels. Thereby the cost of the investigation would be considerably lowered, to the ultimate benefit of agriculture."

On the mobility of exchangeable cations in the soil, S. S. Jarusov (*Soil Sci., 43 (1937), No. 4, pp. 285–303*).—The author finds in part that:

"The mobility of exchangeable cations depends upon the physicochemical properties of the adsorbents and their structural characteristics, determining the strength of the bond uniting the cations and participating in the exchange with the complex. This mobility also depends upon the degree of saturation of the complex by the cation in question. In soils completely saturated by one cation, the mobility of exchangeable cations varies two- to threefold in dependence upon the properties of the soil. The highest mobility is shown by exchangeable cations in red soils; the lowest, in chernozem. As we proceed down

the soil horizons in the chernozem and podzolized zones, the mobility of the cations increases, as a rule.

"The unequal mobility of exchangeable cations in different soils seems to be due to differences in structure of the ion atmosphere of colloids in these soils. Only that part of the exchangeable cations (the proportions being different in different soils) which composes the looser, external part of the ionic atmosphere participates essentially in the exchange reactions.

"In the case of two cations present in a varying proportion in the complex of one soil and possessing different energies of absorption, the strength of the bond of one of them with the complex (the one with a higher energy of absorption) decreases with the increase of the saturation of the complex by it, and its mobility increases. The mobility of the cation of lower absorption energy changes relatively little with the increase of the saturation of the complex by it. The mobility of exchangeable cations depends not only on the kind of soil and on the degree of saturation of the complex by them, but also on the kind of the exchangeable cations accompanying them in the soil. . . .

"It is evident from the above that the strength of the bond and the mobility of exchangeable cations possess an actual significance for the solution of a number of problems of agronomy, such as the physical properties of soil, the availability of exchangeable cations to the plants, the availability of soil moisture to the plants, the interaction between soils and fertilizers, and the effectiveness of fertilizers."

Studies in the electrodialysis of soils.—I, Electrodialysis by the rotating electrode, Amar Nath Puri and R. C. Hoon (*Soil Sci., 43 (1937), No. 4, pp. 305–309, fig. 1*).—The authors describe and illustrate by a diagram an apparatus in which the cathode consists of a perforated copper cone resting in a glass funnel; the anode, of a cone of gold or platinum wire gauze rotated at from 200 to 300 r. p. m. The diaphragm consists of a cone of a suitable filter paper resting in the cathode cone in the funnel.

"*Electrodialysis, as revealed by the percentage recovery of exchangeable* bases, is quicker with the rotating electrode than with the stationary one. Different exchangeable bases take varying lengths of time for displacement by the same current density. The order of their ease of displacement is Na>K>Ca>Mg. There is very slight recovery of Mg, and it is doubtful if the total content could be recovered by electrodialysis within a reasonable time. The volume of the electrodialysate is slightly greater, and the maximum temperature of the anode chamber, slightly higher in the case of the stationary electrode than in the case of the rotating one. Currents as high as 0.5 a can be passed, using the rotating electrode, without too much heating resulting. With this current exchangeable bases can be recovered in less than an hour. The advantages of a rotating anode are greatly minimized when the size of the anode is large. . . .

"The arrangement of apparatus suggested . . . is simple and cheap. A number of electrodes could be run with the same motor. It is, however, necessary that each cell should have a separate rheostat to adjust the current, which can be kept at approximately 0.5 a. Electrodialysis has limited value as a means of determining exchangeable bases, especially in the case of replaceable Mg; but the rotating electrode is a distinct improvement over the stationary one in regard to rapidity of displacement."

Replaceable base determination by electromigration, H. H. King, M. J. Caldwell, and A. T. Perkins (*Soil Sci., 43 (1937), No. 4, pp. 311–316, figs. 3*).—The authors of this contribution from the Kansas Experiment Station report in part that "results obtained by the various methods indicate that all will give

comparable values for calcium and magnesium. There has appeared no reason in this investigation why the monovalent cations would act differently from those studied. It is probable that the reported discrepancy in the monovalent to divalent base ratios obtained by the electromigration and other methods should be sought in the proper application of the agar blank, since the agar is comparatively rich in the monovalent ions.

"The electromigration method appears to the authors to be more complicated and subject to more variables and difficulties than a leaching process and, while capable of giving similar results, appears to have little decided advantage over a less elaborate system of replaceable base determination."

A method of measuring the capillary tension of soil moisture over a wide moisture range, R. GARDNER (*Soil Sci., 43 (1937), No. 4, pp. 277–283, figs. 2*).—The method proposed in this contribution from the Colorado Experiment Station consists in determining a capillary tension curve for a grade of filter paper and then indirectly determining the tension curve for soils by placing them in contact with the paper at various moisture concentrations.

"Results show that capillary tension curves for soils may be determined by this method with sufficient precision to show the characteristic textural differences between soil types, and may serve as a measure of moisture-storing capacity."

Heat of wetting of some soil colloids at different moisture contents, M. HOSEH (*Soil Sci., 43 (1937), No. 4, pp. 257–275, pl. 1, figs. 4*).—From experiments carried out at the University of California, the author concludes in part that "in heating the soil colloid the amount of water removed depends, other conditions being equal, on the temperature of heating; the history of drying is unimportant. Drying at 110° C. does not remove all of the water found on the surface of the soil colloidal particle. The higher the temperature of heating over the range investigated, i. e., the more energy that is applied, the more water there is removed. The more water that is removed from the soil colloidal particle, the greater is the force with which the particle will attract water, provided it is not rendered inactive. These two forces are proportional, and there is reason to believe that they are equal and opposite. Heat of wetting will be evolved as long as the internal structure of the soil colloidal particle remains unaltered; in this experiment this alteration set in when the colloids were heated above 400°. When the nature of the colloidal particle becomes destroyed, as by sintering, there will be no heat evolved on wetting. A soil colloidal particle may lose water upon heating even beyond the temperature at which there is no heat of wetting."

Chemical nature of organic matter or humus in soils, peat bogs, and composts, S. A. WAKSMAN (*Jour. Chem. Ed., 12 (1935), No. 11, pp. 511–519*).—In a semipopular paper, contributed from the New Jersey Experiment Stations, the author takes up the topics characteristics of humus, decomposition of plant residues and formation of humus, chemical nature of humus, and humus and plant nutrition. The following classification of the various types of humus forms a basis of a part of the discussion: "(*A*) Humus types formed by decomposition of plant and animal residues under aerobic, or only partly anaerobic, conditions in composts and in soil: (1) Humus of composts—stable manures, composts of plant residues with or without addition of inorganic salts ('artificial manures') [and] (2) humus in soil—(*a*) plant residues decomposed under conditions of high acidity or low temperature or both (raw humus in forest soils and in heath soils, alpine humus) [and] (*b*) plant residues decomposed under less acid, neutral, or alkaline conditions (typical soil humus). (*B*) Humus types formed by decomposition of plant and animal residues under

anaerobic conditions: (1) Recent formations—high moor, low moor, and sedimentary peats [and] (2) old formations—soft (brown coals, lignites) and hard coals (anthracites). (*C*) Humus types formed in water basins: (1) Recent formations—water-soluble humus and humus in lake and sea bottoms [and] (2) geologic formations—source beds of petroleum."

Ionic relationships in peat, B. D. Wilson and E. V. Staker (*Soil Sci.*, *43* (*1937*), *No. 4*, *pp. 247–252*).—At the [New York] Cornell Experiment Station, in an investigation of the electrodialysis of peats varying widely in percentage of saturation with bases and in other chemical characteristics, the ions normally functioning as cations were found in the anode compartment of the Mattson cell (E. S. R., 56, p. 115), and ions normally functioning as anions were found in the cathode compartment.

"Ions of this character were found to be intimately associated with the organic matter of the diffusates. The results of the investigation suggest that these ions were transported to the respective poles as integral parts of organic matter rather than as adsorbed particles on the surfaces of organic matter. Most of the exchangeable cations of the peats were found to have been present in the peats as ions of organic salts. Practically all of the sulfur was found to be a component of the organic matter, whereas most of the phosphorus appeared to be in the form of phosphate ions."

The production of macroscopic colonies on plaques of soil, J. K. Wilson (*Jour. Amer. Soc. Agron.*, *29* (*1937*), *No. 4*, *pp. 286–292*).—This contribution from the [New York] Cornell Experiment Station records the results of a study of 366 samples of soil with respect to the production of macroscopic colonies on soil plaques. It is concluded that "if the proper nutritional condition is effected by soil amendments of one sort or another, macroscopic colonies will develop from the flora naturally present in the soil. Some salts appeared to be more effective in this respect than others. $MgNH_4PO_4$ came nearest to universal efficiency. When other salts commonly employed in such work failed to effect colony growth this salt was effective."

The author further shows that "the response or lack of response of the microflora of the soil to the various salts that were employed in the plaques provide no direct forecast of which nutrients should be applied, if any, to a particular soil in order that it may grow field crops successfully. The favorable effect of $CaCO_3$ and of K_2HPO_4 on the development of macroscopic colonies when these materials are applied to soils that possess low pH values suggests that such soils may be deficient in these components, but since such compounds may depress colony growth, . . . [or have] no visible effect at all, it is suggested that more information concerning the factors that favor colony development is necessary before the plaque method can be of much service in forecasting the deficiencies of the soils of New York for specific nutrients."

The availability of the principal nutrients in a soil during the crop-growth period, R. J. Borden (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *41* (*1937*), *No. 1*, *pp. 47–55*, *figs. 5*).—The author notes that it has been customary in determining available nutrients in cultivated soils to sample either before planting or after harvesting. He considers that frequent samples taken during the growth of the crop yield information not obtained in the more usual procedure, and offers tabulated and graphically represented results of semimonthly determinations of available nitrogen, potassium, and phosphate carried through the entire growth period of a cane crop in support of the view expressed.

Carbon dioxide production in mannitol-treated soils as a measure of crop response to soil treatments, W. B. Andrews (*Jour. Amer. Soc. Agron.*,

29 (1937), No. 4, pp. 253–268, fig. 1).—The author of this contribution from the Michigan Experiment Station reports upon a new procedure for studying the relation between crop response and response of micro-organisms to soil treatments and to varying fertility levels. The production of CO_2 is used as a measure of the response of micro-organisms, the procedure consisting in treating soil with mannitol and determining the CO_2 at the end of 24 hr. The following specific results of the experiments with the method are stated:

"The production of CO_2 in soils to which mannitol had been added under controlled laboratory conditions tended to furnish a basis for measuring the nitrogen and phosphorus requirements of soils for cotton. There was a rather high correlation between the response of cotton to lime, phosphorus, and phosphorus and nitrogen and the production of CO_2 by mannitol-treated soils. Potassium, however, did not increase CO_2 production even where potassium gave increases in crop yields. Micro-organisms (CO_2 production) responded to lime and superphosphate only when nitrogen was added. Air drying increased the production of CO_2 on rewetting by some soils, but the results were not consistent. On soils which were deficient in $CaCO_3$, the substitution of $MgCO_3$ for part of the added $CaCO_3$ did not consistently increase the production of CO_2. Calcium arsenate had no effect on CO_2 production when used in large or small amounts, but intermediate quantities reduced it. Superphosphate did not intensify arsenic toxicity to soil micro-organisms, nor did $FeSO_4$ alleviate the harmful effects of arsenic as measured by CO_2 production. This is contrary to crop response. Soils deficient in copper, manganese, and zinc, as indicated by plant growth, showed no deficiency of these elements by this method."

Evaluation of nitrogen in molasses, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 41 (1937), No. 1, pp. 19–24, fig. 1*).—The author reports trials of the effect of molasses on the productivity of a porous, sandy loam soil of pH 5.8. The soil showed a nitrogen availability of 53 lb. per acre-foot and a total nitrogen content of somewhat more than 5,000 lb. per acre-foot.

The application of molasses to this soil depressed crop yields, and there was little evidence to indicate that the nitrogen content of the molasses became available.

Blast-furnace processes for the production of phosphatic and potassic fertilizer materials, P. H. ROYSTER, K. G. CLARK, T. P. HIGNETT, L. E. BOWE, H. I. LANSDON, J. C. SOUTHARD, and J. W. TURRENTINE (*U. S. Dept. Agr., Tech. Bul. 543 (1937), pp. 75, figs. 22*).—The authors report on phosphate, potash, and combined phosphate-potash smelting experiments carried out on a semicommercial scale by the Bureau of Chemistry and Soils from 1927 to 1933.

In the phosphate smelting process the heat requirement closely approximated that needed in the reaction indicated by the following equation:

$$2(CaPO_4)_2+10C+6SiO_2=6CaSiO_3+10CO+P_4.$$

"Only heat at or above 2,255° F. is available for carrying out the phosphate-reduction reaction. The amount of phosphate reduced is limited by the heat available above this temperature. Within the limits 0.82 to 1.12, the base-acid ratio of the charge, $\frac{CaO+MgO}{Al_2O_3+SiO_2}$, was not found to affect appreciably either the heat required by or the efficiency of the reduction process.

"Phosphate smelting is technically feasible with low or medium blast temperatures but is commercially practicable for fertilizer production only if high blast temperatures are available."

The results of the potash smelting experiments showed that: "The heat involved in potash-volatilization reactions occurring in the blast furnace was too small to be detected. The principal heat requirements of potash smelting are, therefore, the heat required to slag the charge, to decompose the blast moisture, and to satisfy the heat losses. Volatilization to the extent of 90 percent was not realized from charges having a base-acid ratio, $\frac{CaO+MgO}{Al_2O_3+SiO_2}$, less than 0.9. The addition of calcium chloride increased the volatilization of potash from charges having low base-acid ratios. This effect was less pronounced for charges having base-acid ratios as great as 0.9.

"Potash smelting is a technically feasible process but is commercially practicable only if low-cost limestone and fuel are obtainable."

The results of the combined potash-phosphate smelting experiments showed that: "The combined smelting of potash and phosphate offers no technical difficulties not met in the two separate processes.

"Combined smelting is commercially more attractive than the smelting of the same amounts of potash and phosphate independently because it requires less fuel and flux and yields a more easily transported product.

"It must be emphasized that methods for recovering the products in all three processes require further investigation. It should also be pointed out that the indicated possibilities in these processes, especially in the phosphate and potash-phosphate processes, depend largely upon the development and application of stoves capable of economically producing blast temperatures several hundred degrees higher than in present iron blast-furnace practice. It is expected that the stoves used in this investigation will point the way to such a development. In potash smelting the exact amount of calcium chloride required is uncertain, the consumption of carbon by some unknown reduction reaction is unexplained, and the full benefit of using burned lime as a flux is undetermined. These factors, as well as the applicability of carbonized Wyoming coal as a blast-furnace fuel, remain to be investigated."

Availability of phosphate rocks in soils of varying degrees of acidity, R. P. Bartholomew (*Jour. Amer. Soc. Agron., 29 (1937), No. 4, pp. 293–298*).—At the Arkansas Experiment Station, the author was unable to show that soils of ordinary degrees of acidity cause an increase in the availability of rock phosphates. "It appears evident from the results of the growth studies and from the amount of phosphorus absorbed by the plants that it is only in extremely acid soils that the acidity of the soil may increase the relative availability of the phosphorus in phosphate rocks. Furthermore, from the results presented, rock phosphate cannot be recommended indiscriminately as a fertilizer on acid soils similar to those used in these experiments, since the soil acids have not generally increased the amounts of phosphorus absorbed by plants." With regard to fluorine content, the author finds that "if the results under each degree of acidity are examined, it will be noted that regardless of the degree of acidity there is a general trend for the availability of the phosphorus in the phosphate rock to decrease as the percentage of fluorine in the rock increases."

The effect of carbon dioxide on soil reaction and on the solubility of phosphorus in soils, F. B. Smith, P. E. Brown, H. C. Millar, and H. L. Bodily (*Soil Sci., 43 (1937), No. 2, pp. 93–104*).—An investigation carried out at the Iowa Experiment Station has shown that the solubility of the soil phosphates contained in the soils examined (Carrington loam and Carrington and Tama silt loams) in 0.002 N sulfuric acid is increased by treatment of the soil either

with gaseous carbon dioxide or with a "carbonic acid" solution (water saturated with carbon dioxide, pH 4.2). It was also found, however, that "carbon dioxide or carbonic acid may result in a decreased H-ion concentration of the soil solution, depending upon the soil type. In the untreated Carrington silt loam carbon dioxide increased the H-ion concentration, but treatment with rock phosphate buffered the solution sufficiently so that there was no effect. The Tama silt loam was sufficiently well buffered without the rock phosphate addition to prevent the carbon dioxide producing an acid reaction. Rock phosphate and calcium carbonate in the Tama soil with carbon dioxide resulted in a decrease in H-ion concentration as compared with that of the soil treated with these materials but without the carbon dioxide. Since nitrate production was also stimulated in these soils by carbon dioxide, it would seem that the increase in pH was due to a hydrolysis of the ammonifiable and nitrifiable organic matter. The increased solubility of phosphorus in these cases is certainly not due to an increased H-ion concentration but may be explained on the basis of the production of more soluble forms of phosphorus coincident with the change in soil reaction. Thus, the net effect of carbonic acid or carbon dioxide is an increased solubility of the phosphorus, regardless of the effect of the carbon dioxide on soil reaction. This is further emphasized by the fact that the correlation between the pH of the soil and the phosphorus soluble in 0.002 N sulfuric acid was not significant."

Carbon dioxide was more effective in increasing the solubility of phosphorus in the untreated Carrington silt loam than was the carbonic acid, but the reverse relation was found in the untreated Tama silt loam. In the rock phosphate-treated soils the carbonic acid was more effective than carbon dioxide in the Carrington silt loam, but again the reverse relation was obtained in the Tama silt loam. "In other words treating the Carrington silt loam with rock phosphate caused it to react to carbonic acid in the same way as the untreated Tama silt loam. This treatment also caused the same directional change in pH of the two soils. This does not seem to be an important point, but it serves to emphasize the fact that carbon dioxide may have different effects in different soils and also that the forms of phosphorus in the two soils may be very different.

"The results obtained with 0.002 N sulfuric acid as the extractant of the phosphorus are perhaps different from those that would have been obtained with any other extractant. However, the fact that carbonic acid or carbon dioxide increased the solubility of the soil phosphorus in this relatively strongly acid solution would seem more significant than if similar results had been obtained with a less acid solution as the extractant."

Rare elements in German brown-coal ashes, W. FUCHS (*Indus. and Engin. Chem., 27 (1935), No. 9, pp. 1099, 1100*).—The author reports from the New Jersey Experiment Stations that "a certain favorable effect on plant growth could be traced back to the water-soluble substances in the coal, possibly the rare elements." Of 45 elements sought in the analysis of brown-coal ash, 25 were found in quantities ranging from 35.6 percent (calcium) and 10.7 percent (iron) to 10^{-6} percent or less.

Registration, labeling, and inspection of commercial fertilizers, 1936, F. B. MUMFORD, L. D. HAIGH, and E. W. COWAN (*Missouri Sta. Bul. 381 (1937), pp. 43*).—The usual analytical data, and related information concerning the 1936 fertilizer inspection, are brought together in this bulletin.

Analyses of commercial fertilizers and ground bone; analyses of agricultural lime, 1936, C. S. CATHCART (*New Jersey Stas. Bul. 622 (1937),*

pp. 15).—The analytical data here recorded concern the composition of fertilizers and fertilizer materials registered after March 13, 1936 (E. S. R., 77, p. 25). The bulletin contains also a discussion of the inspection as a whole, together with statistical and other pertinent information.

AGRICULTURAL BOTANY

Protoplasm, W. SEIFRIZ (*New York and London: McGraw-Hill Book Co., 1936, pp. X+584, figs. 179*).—The author has endeavored to bring together all those parts of the branches of science which bear on the physical chemistry of living matter. So far as consistent with accuracy and completeness the presentation is nontechnical, and the text is subdivided under the following subjects: The living substance, the cell, model making, micrurgy, tissue culture, the colloidal state, emulsions, hydrophilic sols and gels, surface tension, adsorption, osmosis, imbibition, viscosity, elasticity, the structure of protoplasm and organic colloidal matter, permeability, acidity, electrophysiology, electrokinetics, radiant energy, the role of water, salts, carbohydrates, fats, proteins, regulatory substances, and the origin of living matter.

A topical bibliography of over 23 pages and a combined author and subject index are provided.

A recording potentiometer for use in physiological investigations, R. H. WALLACE (*Plant Physiol., 12 (1937), No. 2, pp. 487–498, figs. 7*).—As ordinarily adjusted the instrument described and illustrated in this contribution by the Connecticut State College is activated by 0.1 μa (i. e., 0.1 mv), and higher or lower sensitivity can be obtained. Fundamentally, it is a self-balancing Wheatstone bridge of the null-indicator type. The universal bridge can be adjusted to get any millivoltage from 3 to the full value of the battery. Calibration is made with the usual potentiometer. The drum, which is 36 cm in circumference, can be made to turn once a minute, once an hour, or twice a day. The complete instrument can be readily built, and no fundamental element of the one described has been replaced in a year of continuous use. The operation and application of the apparatus are described in some detail.

[Work in plant physiology by the New Jersey Stations] (*New Jersey Stas. Rpt. 1936, pp. 78–84*).—Reports of progress are given on boron and manganese deficiency (including the adequacy of the boron and manganese content of natural nitrate of soda to support plant growth in sand culture, morphological studies of boron-deficient plants, microchemical study of the effects of boron deficiency, the effect of boron deficiency in cotton upon absorption rates of potassium and nitrogen, and microchemical analysis of boron-deficient cotton plants); investigation of the relation of H-ion concentration of plant tissues to iron availability and distribution in plants (corn used); effect of aeration on the growth of oat plants in solution cultures; nutrition studies with corn; the growth of beets in sand culture with different levels of potassium supply; and the effect of nutrient salt concentration upon the growth of the snapdragon plant.

Studies on wheat grown under constant conditions: A monograph on growth, H. L. VAN DE SANDE-BAKHUYZEN (*Stanford University, Calif.: Food Res. Inst., 1937, pp. XVI+400, figs. 27*).—This monographic study, the results of which are addressed mainly to the specialist, was undertaken primarily to determine the physiological bases for correlations of growth and yields with environal factors such as temperature, radiation, rainfall, fertilization, etc. The seven main parts deal, respectively, with the growth curve in annual plants, methods and materials used in the investigation, general growth fea-

tures, dry weight and moisture content of the different organs, dry weight and moisture of the "standard" plant, nitrogen and carbon of the organs, and nitrogen metabolism in relation to growth and development.

This volume also contains contributions on the carbon and nitrogen content of the wheat plant, by E. P. Griffing and C. L. Alsberg.

Devernalization of winter rye by high temperature, F. G. Gregory and O. N. Purvis (*Nature [London], 138 (1936), No. 3502, pp. 1013, 1014, fig. 1*).—The results of tests in which imbibed seeds were held in air and in nitrogen at various temperatures and for various periods of time indicated that high temperature negatives the effect of low temperature progressively as the relative period of high temperature is increased, and that this effect is not due directly to the anaerobic condition. It is stated that the check to growth is not the potent factor in vernalization, but that the effect must be attributed to the low temperature.

The vascular anatomy of Helianthus annuus L., J. H. Priestley and L. I. Scott (*Leeds Phil. and Lit. Soc. Proc., 3 (1936), No. 3, pp. 159–173, pl. 1, figs. 3*).—"Recent work on tree growth has shown a close relation between extension and radial growth. The anatomy of *Helianthus* is analyzed from this point of view. . . . Cambial activity commences at the leaf insertion, as this is a position of minimum extension. Subsequently it spreads both up and down but its special feature is the unlimited propagation downwards. The uniformity of vessel counts at different levels down a leaf trace bundle is discussed as evidence for simultaneity of vessel expansion over considerable distances. Protophloem strands develop basifugally and form an anastomosing system. Possibly these are associated with the movement of food, derived from adult leaves up towards levels where young primordia are growing."

A note upon summer wood production in the tree, J. H. Priestley and L. I. Scott (*Leeds Phil. and Lit. Soc. Proc., 3 (1936), No. 4, pp. 235–248, pl. 1*).—"Recent studies have shown that the earlier spring wood formation is initiated by the vascular differentiation in the leaves of the extending shoot and from thence extends basipetally throughout the tree. The point is now examined as to whether the later formed wood has a similar connection with growth activities proceeding at the apex." It is concluded that "summer wood is . . . necessarily late formed, but the extent to which it takes on the characteristics usually associated with summer wood depends at any point in its basipetal course of development upon the conditions of water and food supply in the surrounding tissues at the moment of its differentiation at this point."

Sap ascent in the tree, J. H. Priestley (*Sci. Prog. [London], 30 (1935), No. 117, pp. 42–56, fig. 1*).—The author first presents some criticisms of the cohesion theory of sap ascent and then reviews recent studies (especially his own) on vessel differentiation and water movement into the bud. His "main thesis has been twofold: (1) That the cohesion hypothesis does not rest upon a satisfactory experimental basis, and that (2) the movement of water into the expanding leaves in spring is associated with processes of growth and differentiation both in leaf and woody axis which are entirely neglected at present in the orthodox treatment of the problems of sap ascent."

The pollen production of anemophylous plants: A comparative investigation with reference to the pollination process in animal pollinated plants and pollen-analytical forest history studies. (Investigations of the morphology and biology of pollen, VI.) [trans. title], F. Pohl (*Bot. Centbl., Beihefte, 56 (1937), Abt. A, No. 2–3, pp. 365–470, figs. 7*).—Continuing this series of studies (E. S. R., 66, p. 319), this monograph deals with the quantitative pollen yield of wind- v. animal-pollinated plants, and with the amount of pollen

produced in relation to the number of ovules to be fertilized. The study included 39 species, predominantly of wind-pollinated plants. There is a bibliography of 80 references.

The continuous measurement of photosynthesis, respiration, and transpiration of alfalfa and wheat growing under field conditions, M. D. THOMAS and G. R. HILL (*Plant Physiol., 12 (1937), No. 2, pp. 285–307, figs. 10*).—The authors describe and illustrate apparatus designed to measure continuously and automatically the CO_2 exchange and transpiration of plants in situ. By its use the CO_2 exchange of two similar plats of alfalfa was measured simultaneously and continuously for 26 days, and the hourly values of respiration and photosynthesis were plotted. Data summarizing the daily apparent assimilation values of a wheat plat from the boot to the dough stages are also presented.

The alfalfa curves indicate that the two plats gave closely concordant respiratory and photosynthetic responses to the environment. Statistical analyses of the curves indicate the value of the apparatus for measuring very small effects of an experimental treatment. The influence of clouds on the photosynthetic rate was strikingly shown by the curves, and the data obtained indicate the rate in alfalfa to be a linear function of the sunlight intensity up to about 52 percent of the normal maximum at Logan, Utah. Greater intensities did not increase the rate appreciably. Respiration varied with the temperature, increasing about fourfold in rate between 0° and 20° C. Only 16.5 percent of the CO_2 assimilated could be accounted for as top growth, the remainder probably being stored in the roots.

The wheat data indicated that the assimilatory rate reaches a maximum in the flowering stage and then falls off in the milk and dough stages owing to senescence. The top growth accounted for 83.3 percent of the net assimilation.

The transpiration curves resembled the CO_2 exchange curves in shape, but were more pointed and also definitely skew in the daytime. The transpiration curves evidently reflected the temperature changes closely, whereas photosynthesis followed more nearly the light intensity. The average deviation of the transpiration values for the two alfalfa plats was less than 5 percent.

Induced changes in respiration rates and time relations in the changes in internal factors, L. P. MILLER, J. D. GUTHRIE, and F. E. DENNY (*Contrib. Boyce Thompson Inst., 8 (1936), No. 1, pp. 41–61, figs. 5*).—Treatments of potato tubers with vapors of various chemicals which increased the CO_2 output also usually induced large increases in the sugar content, but these increases did not occur until after the peak of the higher respiratory activity had passed. During the period of rapid rise in CO_2 output the sugar content remained unchanged or decreased. Ethyl alcohol, which decreased the CO_2 output, had little effect on the sugar content or induced decreases. Catalase and peroxidase activity also were not directly connected with CO_2 output changes. Chemicals which increased respiration induced large increases in the activity of these enzymes, but these changes tended to follow rather than precede or coincide with changes in CO_2 output. With ethyl mercaptan this enzyme activity was depressed much below the control while the rise in CO_2 output was taking place and during its peak, and it was only later, when the respiratory rate was decreasing, that these enzymes were more active in the treated than in the control tubers. Ethyl alcohol, which decreased respiration, increased catalase activity and decreased peroxidase activity.

The increase in methylene blue reducing capacity of the juice that follows ethylene chlorhydrin or butyl halide treatments is not the cause of the increased respiration induced by these treatments, since the increase in reducing

capacity occurred later than the increase in respiration. The decrease in citric acid and increase in pH began at about the same time as the increase in respiration, there being a correlation among these three changes. These results support the view that citric acid is converted into CO_2 in the rapidly respiring tissue and that the pH increases from the decrease in citric acid. Citric acid is probably the source of a large part of the CO_2 produced by the treated tissue. The large increase in glutathione following treatment with ethylene chlorhydrin is not the cause of the increased respiration, since it took place 40–60 hr. after the beginning of treatment and much later than the increase in respiration. Butyl halides, which induce large increases in respiration, decrease the glutathione content, possibly by some direct action on glutathione. The decrease in sulfate following treatment with ethylene chlorhydrin probably occurs about the same time as the increase in glutathione and may thus be due to utilization of sulfate in the glutathione synthesis.

Time course of photosynthesis for a higher plant, E. D. McAlister (*Smithsn. Misc. Collect., 95 (1937), No. 24, pp. 17, pls. 2, figs. 10*).—The author describes and illustrates a new spectrographic method of gas analysis which he has here applied to measurements of the CO_2 exchange between Marquis wheat and its environment, these being the first ever made on the time course of photosynthesis during the first few seconds after illumination of a higher plant.

Using this method, it was found that the induction period represents a certain amount of CO_2 lost to photosynthesis. This amount lost approaches zero progressively with decreasing intensities of illumination and is apparently approaching an asymptotic value at high light intensities. The induction period is prolonged to 12 or 15 min. after a night of darkness. The striking similarity of the present data with previous work on algae indicates a mechanism of CO_2 assimilation fundamentally alike. The importance of the induction period in elucidating photosynthesis is emphasized, since it is chemical in nature, sensitive to temperature, and is produced by light. Induction in intermittent illumination of equal light and dark periods is shown to be very small at high frequencies—one-sixtieth second length period—and is larger than normal for periods of 5–15 sec.

The immediate appearance of respiration at the termination of illumination with a rate equal to that before illumination, together with its independence of light intensity as here reported, led to the conclusion that light has no direct effect on respiration.

A minimum CO_2 assimilation in flashing light (equal light and dark periods) occurred between 15-sec. periods and continuous illumination. This miminum probably falls between 1- and 5-min. periods. The usual increase in assimilatory efficiency with increasing frequency of intermittency (for periods of less than 15 sec.) was found in young wheat plants, and it approached a limiting increase of 100 percent over continuous light.

The short-time relations reported for respiration and CO_2 assimilation in wheat strikingly confirm and correlate with much of the work on the fluorescence of chlorophyll in higher plants. Furthermore, in addition to the new results, most of the previous work on the time course of photosynthesis with algae is here verified for wheat.

Effect of light intensity on the photosynthetic efficiency of tomato plants, A. M. Porter (*Plant Physiol., 12 (1937), No. 2, pp. 225–252, fig. 1*).—In this study by the Michigan Experiment Station, Grand Rapids Forcing tomatoes were grown under average daily light intensities of 1,139.9, 583.1, and 261 foot-candles, with the following results: The stem elongation and leaf-area expansion responses were both continuously and finally greater with the lower light

intensities. When the light intensity reached a definite average the fruit set rather freely and developed. The percentages of dry matter, ash, water, fresh weight, and elaborated food materials correlated rather closely with the light intensity supplied. Light intensity proved to be the chief cause of differences in plant efficiency. Basal metabolism and its contributing factors were regulated by the amount of light received by the plants. The increase in multiple over simple correlations under each degree of light intensity furnished evidence of interrelationships between factors regulating plant food manufacture. The coefficients of determination demonstrated that light intensity alone accounts for 32.4 percent of the photosynthate variation, and that temperature and humidity are negligible factors only when correlated with light intensity—humidity becoming a critical factor in photosynthesis when light intensity is reduced.

Light intensity appeared to have a regulatory influence on the average amounts of chlorophyll per unit leaf area. The chloroplasts arranged themselves for the highest reception of light when the latter was reduced. In shaded plants the leaf anatomy was abnormal, consisting of loosely arranged, irregular spongy parenchyma cells and a reduction in the size, density, and number of palisade cells.

The average light intensity of 1,139.9 footcandles daily during growth had a greater effect in promoting chlorophyll formation, fruit production, and photosynthetic efficiency in tomatoes than the daily average of 583.1 footcandles. This, in turn, had a greater effect than the daily average of 261 footcandles.

The influence of light induction on the development of Perilla ocymoides, I [trans. title], E. D. Bouslova and V. N. Lubimenko (*Compt. Rend.* (*Dok.*) *Acad. Sci. U. R. S. S., n. ser, 14 (1937), No. 3, pp. 143–147, figs. 2*).—Experiments with *P. ocymoides* (a short-day plant) led to the conclusion that, under conditions of natural lighting, intense light induces an acceleration in flowering, whereas feeble light retards the process. Shortening of the natural day of 16 hr. by division of the light period into 2 halves equal in intensity and quality of light increased the reaction induced by the intense light, accelerating flowering and at the same time causing a pronounced retardation in vegetative growth. Apparently it is not the length of daylight per se, but the duration of the action of strong and of feeble light which is important for the development of short-day plants.

Contribution to the theory of photoperiodism, II [trans. title], V. N. Lubimenko and E. D. Bouslova (*Compt. Rend.* (*Dok.*) *Acad. Sci. U. R. S. S., n. ser., 14 (1937), No. 3, pp. 149–152, fig. 1*).—Continuing this series (see preceding entry), experiments with *Perilla ocymoides* indicated that shortening of the natural day to 7 hr. by shading isolated leaves results in acceleration of flowering of axillary buds and in retardation of stem elongation and leaf development. Cutting the midvein of the shaded leaf suppressed the effect of the shortened day. It is concluded that acceleration of flowering and retardation of vegetative development are due to the action of an especially active substance elaborated by the leaves and transferred to the axillary buds by the routes which serve to transport assimilatory substances from the leaves into the stem.

Nature of the Blackman reaction in photosynthesis, R. Emerson and L. Green (*Plant Physiol., 12 (1937), No. 2, pp. 537–545, figs. 3*).—The results here presented led the authors to believe that no significant similarity exists between the Blackman reaction and the peroxidase decomposition. This leaves no support for the theory that the Blackman reaction involves the decomposition of some peroxide by catalase, but it is emphasized that no data thus far

known to the authors constitute conclusive proof that this reaction is not a peroxide decomposition. It is suggested, however, that the Warburg "acceptor theory", abandoned in favor of the peroxide theory, is still worthy of consideration as a basis for constructing a mechanism of photosynthesis.

Influence of weak electric currents upon the growth of the coleoptile, N. G. Cholodny and E. Ch. Sankewitsch (*Plant Physiol., 12 (1937), No. 2, pp. 385–408, figs. 3*).—The authors' main object was to check the hypothesis of Went (E. S. R., 64, p. 326) and of F. Kögl, who assumed that the translocation of the growth substance in plant organs is by cataphoresis. It was found that passage through the isolated coleoptile of oats and rye of a current of the order 10^{-7}–10^{-6} a, directed from the base to the apex of the coleoptile, caused a noticeable growth acceleration which lasted for a short time and in most cases was followed by a definite retardation. If the current was increased by an initial strength during the test, the growth curve rose again for a short time. At the lower temperatures used an electric current directed to the coleoptile apex sometimes did not decrease growth but increased it somewhat, bringing growth to its normal level. A current of 10^{-7}–10^{-6} a, directed from the coleoptile apex to its base, in most cases retarded coleoptile growth, the retardation continuing after the current was switched off. Analogous phenomena were noted also in uninjured oat seedlings when an electric current of the above order was passed through the coleoptile or through the whole plant.

The experiments described fail to confirm the hypothesis expounded by Went and by Kögl, i. e., the results presented seem to confirm the conclusion that the electric current affects the translocation of the hormone not directly as an electrolyte but indirectly through the complex system of the living protoplasm.

Exchange of electrolytes between roots and acid solutions, R. Beall (*Plant Physiol., 12 (1937), No. 2, pp. 455–470, figs. 5*).—*Lupinus albus* roots absorbed electrolytes from very dilute solutions of certain inorganic and organic acids. Absorption was greater and more rapid the higher the original concentration, and for any tested concentration it was greater as dissociation was more complete. There was apparently a rapid absorption of hydrogen ions, probably accompanied by some of other ions or of molecules (or both). Injury resulted in all cases, probably attributable to absorbed hydrogen ions in each instance except for propionic acid, where the undissociated molecules seem to have been largely responsible. In many cases rapid exosmosis from the roots eventually occurred, indicating increased permeability of the cell membranes or rapid disintegration of the cell contents. The influence of temperature, concentration of solution, and H-ion concentration on absorption and exosmosis and on growth and development of the seedlings are discussed, and a bibliography of 25 titles is included.

Electrical polarity and auxin transport, W. G. Clark (*Plant Physiol., 12 (1937), No. 2, pp. 409–440, figs. 10*).—Went's bipolar dye-uptake tests (E. S. R., 64, p. 326), used to substantiate his electrical transport theory, were repeated and confirmed. Positively charged dyes were taken up most by bases, negatively charged dyes by apexes, of *Impatiens* cuttings, which agrees with the fact that electrical measurements indicated *Impatiens* cuttings to have apical electronegativity. Intact coleoptiles of *Avena* and *Zea*, stems of *Pisum*, and hypocotyls of *Impatiens* exhibited apical negativity when constancy of potential difference measurements was obtained. Cut sections of *Avena* and *Zea* coleoptiles and of *Pisum* and *Vicia* stems exhibited the same polarity as the *Impatiens* cuttings. Time was required to establish this polarity. The p. d.'s of sections were directly proportional to the length of the sections. The internal electrical

polarity of *Avena* coleoptiles was the same as the external. Inverting of sections inverted their electrical polarity, i. e., the morphological apexes became electropositive to the bases. This inverted polarity disappeared with time. It was proportional to the length of the sections as in the case of upright sections, and the time of disappearance of the inverted polarity was proportional to the length of the sections.

A bibliography of 85 titles is included.

Tuberization of the Colorado wild potato as affected by X-radiation, E. L. JOHNSON (*Plant. Physiol., 12 (1937), No. 2, pp. 547–551, figs. 1*).—"Radiation of wild potato tubers with light doses of X-rays failed to give increased number of progeny. Treatment of unsprouted tubers with moderate doses resulted in only a slight increase in number of progeny and in average weight per hill. Progeny from sprouted mothers which had been treated with 1,500 r-units gave the following percentage of increase over the controls: Average number of tubers per hill, 41 percent; average weight per hill, 56 percent; [and] average weight per tuber, 11 percent. The explanation advanced for the greatly increased production from treated tubers is that there is a probable increased rhizome development which results in greater tuber production. This is similar to the increased aerial branching which occurs in some other members of Solanaceae when young plants are treated with medium doses."

The respiration of bananas in presence of ethylene, R. GANE (*New Phytol., 36 (1937) No. 2, pp. 170–178, figs. 7*).—Evidence that ripe bananas produce ethylene is given. The effect on pea seedlings was paralleled by low concentrations of ethylene. Acceleration of ripening in unripe bananas by ethylene at 1 p. p. m. was similar to that induced by the metabolic products of ripe bananas. "It would appear that ethylene is a normal product of metabolism during the climacteric when it acts as an autocatalyst." Ethylene can be removed from air by ozone. The latter causes a retardation of normal ripening, probably by blocking of the stomata. Similar retarding effects were induced in fruits treated with H_2O_2, iodine, and vaseline.

Lag in water absorption by plants in water culture with respect to changes in wind, J. D. WILSON and B. E. LIVINGSTON (*Plant Physiol., 12 (1937), No. 1, pp. 135–150, figs. 3*).—In a series of wind-tunnel tests on water absorption rooted cuttings were employed, mostly of *Salix purpurea*, but with *S. nigra* and *Cephalanthus occidentalis* in some of the tests. To make sure that the water supply to the roots would always be unlimited, solution cultures were employed such that the rates of water absorption and transpiration must have been generally limited or controlled only by internal characteristics of the plants themselves and by the evaporating power of the aerial environment. The procedures used are outlined, and the results are discussed in great detail.

The full effect of any pronounced alteration in air movement past plant or atmometer, which would measurably change the rates of transpiration or evaporation, was not immediately indicated in terms of bubble movement in the potometer. There was always a lag. Considerable increase or decrease in wind velocity apparently increased or decreased transpiration or evaporation almost instantly, but the lapse of the lag period was required before the potometer readings represented the transpiration or evaporation rates corresponding to the new air condition. The lag period was longer as the preceding steady rate of absorption for calm air had been slower, and conversely, thus showing a fairly clear diurnal march. It was apparently not generally and consistently related to the accelerating effect of wind on transpiration. This lag period is probably of considerable importance, especially with regard to plant absorption.

It seemed clear that the potometer lag represented hydrostatic readjustments of some sort within the plant, and that the lag period represented the time required for the propagation of a hydrostatic-pressure change from transpiring membranes in the leaves to the external solution bathing the absorbing membranes at the root surfaces. The lag period proved longer for plants with longer stems. It was also found that the introduction of solutes into the liquid around the roots retarded the absorption rate, either through an increase in the osmotic value of the medium or through specific physiological or chemical effects on the absorbing cells, or even on other tissues (e. g., stem and leaf).

Diastatic activity of orange leaves as affected by time, temperature, pH, and certain zinc salts, W. B. Sinclair and E. T. Bartholomew (*Jour. Agr. Res. [U. S.], 54 (1937), No. 8, pp. 609–619, figs. 3*).—In this investigation by the California Citrus Experiment Station no significant differences occurred in the diastatic activity of citrus leaves at pH 4.0–5.4. About 48 hr. were required to reach equilibrium with macerated citrus-leaf tissues. The diastase of the leaves had a maximum activity at 60°–65° C., the activity being much greater with young than with mature leaves but both showing similar responses to temperature. Leaves with adequate amounts of starch and diastase showed little activity on autolysis of the macerated tissue in distilled water. The natural starch of the leaf appeared to be bonud by the chloroplast and was not reacted upon to any great extent by the naturally occurring diastase. A small increase in activity was noted when adjusted to pH 4.7, but when takadiastase was added to macerated leaf tissue at pH 4.7 the natural starch was hydrolyzed. However, if macerated leaf-tissue samples were added to a starch solution at pH 4.7 and incubated, the leaf enzyme converted the starch to reducing substances.

In zinc concentrations containing as much as 30 milligram equivalents of zinc per liter, takadiastase was found capable of converting starch to glucose quantitatively. These zinc concentrations appeared to produce no paralyzing effects on the enzymic activity. In tests performed in $ZnCl_2$ and $ZnSO_4$ solutions, the diastase in macerated leaf tissues produced about the same amounts of reducing substances in zinc concentrations containing 0–30 m. e. per liter.

The relations of the findings to the zinc therapy of citrus mottle-leaf are discussed.

The synthesis of sucrose by excised blades of sugar cane, C. E. Hartt (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 41 (1937), No. 1, pp. 33–46, figs. 3*).—It was found that the leaf blade manufactures sucrose when supplied with glucose and fructose, the process taking place in darkness and not requiring chlorophyll. Within the limits of 1–25 percent there was always a higher percentage of sucrose than of simple sugars in the blades, regardless of the concentration of glucose supplied. Synthesis was most efficient when the blades were supplied with a 5 percent solution of glucose, in which 83 percent of the sugar absorbed was converted into sucrose within 24 hr. Since the synthesis took place when the blades were supplied with glucose or fructose alone, and since sucrose contains both, a transformation from glucose to fructose and from fructose to glucose occurs in the leaf blades. The interconversion of glucose and fructose occurred equally well whichever sugar was supplied. Sucrose fluctuated more widely than the simple sugars in the blades supplied with glucose or fructose. The results thus agree with the viewpoint that the simple sugars are formed first in photosynthesis and are then converted into sucrose.

Effect of certain nutrient deficiencies on stomatal behavior, M. C. Desai (*Plant Physiol., 12 (1937), No. 2, pp. 253–283, figs. 10*).—In this contribution

by Cornell University the effects of deficiencies in potassium, phosphorus, and nitrogen were noted for *Zea*, *Pisum*, *Phaseolus*, *Nicotiana*, *Tradescantia*, etc., the stomatal behavior being observed in the distal third of the lower leaf surface of the third or fourth leaf from the growing stem apex. Of the methods tried the direct visual and Lloyd's strip methods proved best, and a modification of the latter had many advantages over the former. On the whole, the general deficiency symptoms resembled those reported by others, and whenever these were strikingly shown the stomatal behavior was decidedly abnormal. In plants in full-nutrient cultures the stomata were more responsive to changing environal conditions than in those deficient in any of the three elements tested. Night opening of stomata was noted in practically all plants used except *Zea*. With excess potassium the plants were slightly smaller, their lower leaves mottled, and their stomata showed slight lethargic movement. The number of stomata per unit area varied little, but their distribution was much more irregular in the deficient plants. Apparently the stomatal behavior reflects the general metabolic condition. Subnormal behavior was accompanied by increased water requirement, decreased yield, and decreased size of the plants. The average stomatal aperture was proportional to the size of the plant as determined by nutrition.

It is apparent that the leaf activities (photosynthesis, respiration, and transpiration) control the stomatal behavior. "That the condition of stomatal mechanism itself does not change in deficient cultures is indicated by the fact that when placed in ammonium hydroxide solution the stomata in all cultures respond similarly."

Boron deficiency phenomena in grape seedlings in water culture tests [trans. title], W. Maier (*Gartenbauwissenschaft, 11 (1937), No. 1, pp. 1–16, figs. 10*).—Using the v. d. Crone nutrient solution to which were added in various combinations traces of the elements Li, Cu, Zn, B, Al, Sn, Mn, Ni, Co, Ti, I, and Br, it was found that boron possesses a growth-promoting action, inducing a more vigorous shoot formation, higher fresh-weight production, and a significantly stronger development of the root system. None of the other trace elements tested could replace boron, a deficiency of which evoked various injuries to the seedlings, extending to the growing point of the shoots, the length of the internodes, the size, color, form, and arrangement of the leaf blades, and to the petioles. Boron-deficient seedlings also tended to form lateral shoots.

Selenium absorption by crop plants as related to their sulphur requirement, A. M. Hurd-Karrer (*Jour. Agr. Res.* [*U. S.*], *54 (1937), No. 8, pp. 601–608, figs. 4*).—"Wide differences in the absorption of selenium from sodium selenate by 19 different crop plants grown in Keyport clay loam, untreated with respect to sulfur, were directly correlated with corresponding differences in their respective sulfur-absorbing capacities. The parallelism suggests that the sulfur requirement of the plant determines its tendency to absorb selenium."

The physiological anatomy of the legume testa: Contributions to the problem of hard seeds and to the significance of the strophiole [trans. title], K. Zimmermann (*Landw. Vers. Sta., 127 (1936), No. 1–2, pp. 1–56, figs. 45*).—This study of 24 species belonging to 14 genera and 8 tribes of the subfamily Papilionaceae of the Leguminosae dealt with the differing structure of the testa and its relation to the hard seed problem, the different types of strophiole and their relation to hard seeds, the developmental history of the strophiole, the relation between the thickness of the testa and the hard seed condition, and the microchemistry of the testa. The literature references

GENETICS

Mendel and his place in the development of genetics, S. W. Fernberger (*Jour. Franklin Inst., 223 (1937), No. 2, pp. 147–172, figs. 4*).—An account of the life and work of Gregor Mendel.

A glossary of genetic terms (*Jour. Heredity, 28 (1937), No. 2, pp. 71–80*).

Chromosome structure, B. R. Nebel and M. L. Ruttle (*Genetics, 22 (1937), No. 1, p. 202*).—This contribution by the New York State Experiment Station is an abstract of a "comparative study of the history of chromonemata in *Tradescantia, Trillium, Hordeum, Secale*, and *Dissosteira* (Orthopteran)."

On the morphology of the chromosomes in Gallinaceae, N. N. Sokolow, G. G. Tiniakow, and J. E. Trofimov (*Cytologia, 7 (1936), No. 4, pp. 466–489, figs. 19*).—Comparison is reported on the morphology of the chromosomes of the common fowl (*Gallus domesticus*), Caucasian pheasant (*Phasianus colchicus*), silver pheasant (*Nycthemerus argentatus*), peacock (*Pavo cristatus*), guinea fowl (*Numidae meleagris*), turkey (*Melagris gallopavo*), and woodcock (*Tetrao tetrix*). Similarity of a number of the chromosomes in the different species seemed evident.

The genetical and mechanical properties of the sex-chromosomes.—II, Marsupials, P. C. Koller (*Jour. Genet., 32 (1936), No. 3, pp. 451–472, figs. 17*).—Continuing studies on the sex-chromosomes of the rat during meiosis,[3] a report is given on the behavior of the sex-chromosomes during meiosis and the mitotic division immediately preceding it in *Dasyurus maculatus, Sarcophilus ursinus, Phascolarctus cinereus, Pseudochirus peregrinus*, and *Trichosurus vulpecula*. These results showed that the sex-chromosomes are composed of a deeply stained segment which is the genetically active region and a lightly stained segment not ordinarily visible during mitosis. This portion is more or less inert but contains the centrosome.

Cytology and breeding with fruits, B. R. Nebel (*Zellforschung und Neuzüchtung beim Obst und bei der Rebe. Stuttgart: Eugen Ulmer, [1936], pp. 58, figs. 10*).—This little handbook prepared by a staff member of the New York State Experiment Station contains information on the structure and multiplication of the cell, on Mendelism, and on polyploidy, and reviews briefly the present status of genetic knowledge with regard to various fruits including the apple, pear, plum, cherry, peach, strawberry, raspberry, currant, and grape.

A study of the reaction of F_1 oat hybrids and their respective parental lines to inoculation with smuts and rusts, H. B. Humphrey and F. A. Coffman (*Phytopathology, 27 (1937), No. 2, pp. 183–189*).—From the results of inoculations of adult plants with spores of stem and crown rusts, the following conclusions are drawn:

Although parents and progeny were not treated alike, resistance to smut apparently is dominant in F_1 oat plants. Resistance to stem rust usually was dominant in F_1 plants, although subject to some variation. Resistance to crown rust usually was either dominant or intermediate in F_1 plants, but the apparent dominance was less pronounced than was resistance to stem rust. Resistance to either rust in F_1 individuals of certain crosses tended to approximate the type of resistance observed in the more resistant of the parental lines.

Inheritance of resistance to the loose and covered kernel smuts of sorghum, I, II, D. E. Marcy (*Bul. Torrey Bot. Club, 64 (1937), Nos. 4, pp. 209–228, pls. 2, figs. 2; 5, pp. 245–267, figs. 2*).—In part I of this investigation, Dwarf

[3] The genetical and mechanical properties of the sex-chromosomes.—I, *Rattus norvegicus*, ♂, P. C. Koller and C. D. Darlington (Jour. Genet., 29 (1934), No. 2, pp. 159–173, pl. 1, figs. 17).

Yellow Milo Hybrids, true breeding varieties of sorghum (*Andropogon sorghum*) were used. The hybrids studied fell into the three main categories of crosses (1) between resistant varieties, (2) between Dwarf Yellow milo and susceptible varieties, and (3) between feterita and susceptible varieties. The reactions to the two smuts (*Sphacelotheca sorghi* and *S. cruenta*) in the parental varieties corresponded closely, a variety giving high infections with one smut tending to do so with the other, except that the percentages of infection with *S. cruenta* were always lower.

As to infection results with hybrids, genetic evidence is presented that the two resistant varieties feterita and Dwarf Yellow milo possess different factors for resistance to *S. sorghi*, and it is demonstrated that the milo factor is epistatic to the feterita factor. It is also shown that these two varieties have in common at least one factor for resistance to *S. cruenta*, and that a cross between them gives only genetically resistant hybrids.

Inoculated with *S. sorghi*, hybrids between Dwarf Yellow milo and susceptible varieties showed a clear-cut segregation of resistant, segregating, and susceptible progenies, indicating that resistance may be governed by a single factor. Inoculated with *S. cruenta* they failed to show clear-cut segregation, indicating that reaction to this smut may be governed by more than one factor.

In part 2. Feterita Hybrids, it was found from seed germinations under four sets of environal conditions that the susceptible varieties gave highest infections when germinated in sand with 10 percent moisture. Dwarf Yellow milo maintained its resistance under these conditions, but feterita exhibited pathological effects of infection with *S. sorghi* not hitherto noted.

The four susceptible varieties Shallu, Dakota Amber sorgo, Dawn kafir, and Sumac sorgo and the two resistant varieties Dwarf Yellow milo and feterita were used as parents. When Dwarf Yellow milo was crossed with feterita about one-sixtenth of the F_2 was susceptible to covered smut, confirming the assumption that these varieties possess different resistance factors. When Dwarf Yellow milo was crossed with susceptible varieties about one-fourth of the F_2 was susceptible. It is suggested that Dwarf Yellow milo had brought into the crosses a factor for resistance (R) completely epistatic to a factor for susceptibility (S) introduced by the susceptible varieties. When feterita was crossed with susceptible varieties, the results indicated the interaction of the factor S and a factor for resistance introduced by feterita (B). Under highly favorable infection conditions S was shown to be epistatic to B, segregation in F_2 approximating 13 smutted to 3 normal plants. Under less favorable infection conditions the F_2 ratios were nearly reversed, approaching the ratio of 3 resistant to 1 susceptible. It is concluded that hybrids containing both S and B factors were extremely unstable in their infection reactions, and that the epistasis of S over B, or of B over S, was determined by environal conditions during germination.

Infection results with loose smut indicated that when Dwarf Yellow milo was crossed with susceptible varieties there was a two-factor interaction similar to that of feterita hybrids inoculated with covered smut. When feterita was crossed with susceptible varieties there was a clear-cut dominance of resistance, and the results indicated the interaction of three factors. No infected plants were obtained from crosses of feterita with Dwarf Yellow milo, indicating at least one factor for resistance in common. It has been suggested that the factors governing the reaction to *S. sorghi* may also determine that to *S. cruenta*, but that their effect is reversed. The presence of an additional factor influencing *S. cruenta* reactions has complicated the ratios, and, therefore, further data are needed for a more precise analysis of the present results.

[Experiments in animal genetics by the Storrs Station] (*[Connecticut] Storrs Sta. Bul. 214 (1937), pp. 20, 21*).—The hatchability of eggs from normal hens, Creeper hens, and reciprocal crosses of Creeper and normal fowls, and the effect on egg production of removal of the comb from pullets are briefly noted.

[Papers on animal genetics] (*Amer. Soc. Anim. Prod. Proc., 1936, pp. 221–223, 229–232, 236–243, 247–265, fig. 1*).—Brief reports were presented on the following subjects before the American Society of Animal Production: Observations on Reproductive Processes in Dairy Cattle and Their Relation to Breeding Efficiency, by L. E. Casida and W. G. Venzke (pp. 221–223); The Value as Sires for Swine Production of Three Inbred Boars, by R. T. Clark, O. M. Kiser, and L. M. Winters (pp. 229–232); Introductory Remarks Before the Symposium on the Relation of Nutrition to Genetics Research, by P. E. Howe (p. 236); The Role of Nutrition in Genetic Research, by W. V. Lambert, N. R. Ellis, W. H. Black, and H. W. Titus (pp. 236–243); Problems Involved in Breeding for Efficiency of Food Utilization, by M. Kleiber (pp. 247–258); Variations in the Softness of Lard Produced in the Record of Performance Testing, by J. L. Lush, B. H. Thomas, C. C. Culbertson, and F. J. Beard (pp. 258, 259); The Role of Nutrition in Genetic Research, by W. A. Craft and O. S. Willham (pp. 260–263); and Studies of Breeding for Increased Efficiency, by L. M. Winters (pp. 263–265).

[Papers on animal genetics] (*Genetics, 22 (1937), No. 1, pp. 189, 190, 193, 194, 196, 198, 199, 204, 207; also in Genet. Soc. Amer. Rec., 5 (1936), pp. 189, 190, 193, 194, 196, 198, 199, 204, 207*).—Brief abstracts are given of the following papers, presented before the 1936 meetings of the Genetics Society of America: Two Hereditary Types of Hair Deficiency in the Deermouse, by F. H. Clark; Variation in the White-Footed Mouse, *Peromyscus leucopus noveboracensis*, by L. R. Dice; Evidence That Size of Head-Spot (Heatdot, Keeler) in the Mouse Is Not Controlled by Modifiers Distributed Among Many Chromosomes, and A Study of the Inheritance of Body Weight in the Albino Mouse by Selection, both by H. D. Goodale; Bilateral Gynandromorphism in the Barred Rock Fowl, by F. B. Hutt; Genetic Resistance to Deficiency of Vitamin B_1 in the Chick, by W. F. Lamoreux and F. B. Hutt; Malignant Lymphocytes From Perivascular Reticular Cells in Mice of a Leukemic Strain, by J. S. Potter and E. C. MacDowell; and An Analysis of the Action of Color Genes in the Guinea Pig by Means of the Dopa Reaction, by W. L. Russell.

[Genetic experiments with mice and rabbits], W. E. Castle (*Carnegie Inst. Wash. Yearbook, 35 (1935–36), pp. 283–285*).—In studies of size inheritance in mice it was found that both the blue dilute and brown color mutations accelerated general body growth. The short-ear and pink-eye genes retarded general body growth in addition to the specific retardation of growth in the ears by the former gene. A study of the linkage relation of the genes rex_1 and rex_2 in rabbits showed 17.2 percent crossing over in females. Linkage relations between the genes for Himalayan albinism, yellow fat, and brown pigmentation in the rabbit showed crossing over to be more frequent in females than in males—14.4±0.8 and 8.2±1.7 percent, respectively, between *C* and *Y* and 28.4±1.0 and 26.6±2.8 percent, respectively, between *Y* and *B*. The infrequency of double cross-overs indicated interference. The gene satin was inherited independently of sex and the genes for rex_1, rex_2, furless, English, albinism, and H_1 of the blood groups.

Genetical and cytological studies of the intergeneric hybrid of Cairina moschata and Anas platyrhyncha platyrhyncha, F. A. E. Crew and P. C.

KOLLER (*Roy. Soc. Edinb. Proc., 56 (1935–36), No. 3, pp. 210–241, pls. 4, figs. 31*).—In these experiments 117 hybrids between the Muscovy ♂ and Aylesbury ♀ ducks were produced. Although the males had normal sex equipment and large testicles, they were infertile. The females possessed only a rudimentary ovary and oviduct, and exhibited no sex behavior. In the reciprocal cross, Aylesbury ♂ × Muscovy ♀, there were produced 73 hybrids. Both males and females had normal sex organs but both were infertile, although the females laid 164 small eggs. Description is given of the plumage characteristics of the hybrids.

Cytological studies showed the larger chromosomes of the two species to be similar morphologically. Chromosome counts from 48 to 72 were observed. Gametogenesis was abnormal to the extent that no viable gametes were produced. Sterility is suggested as due to complementary genetic factors which alter the relationship of chromosome pairing to spindle development. The abnormalities in the sex equipment are taken to suggest a lack of balance between the sex-determining factors of the two species.

Hybridization and acclimatization of animals, A. A. NURINOVA (NOURINOV) (*Trudy Nauch. Issled. Inst. Gibrid. i Akklim. Zhivotn., Askaniia-Nova, Gibrid. i Akklim. Zhivotn.* (*Works Sci. Res. Inst. Hybrid. and Acclim. Dom. Anim., Ascania-Nova, Hybrid. and Acclim. Anim.*), *2 (1935), pp. 176, figs. [112]*).—Brief results are presented in the English abstracts of the following papers: Pedigree Herd of Rambouillet Sheep at Askaniia-Nova, by M. F. Ivanov (pp. 11–26; Eng. abs., p. 26); Origination of a Mountain Merino, by M. F. Ivanov (pp. 27–41; Eng. abs., p. 41); Moufflon at Askaniia-Nova, by A. Brauner (pp. 42–48; Eng. abs., p. 48); Interbred Hybrids of English Mutton Rams and Fat-tailed Sheep, by F. M. Dobrogorskii (Dobrogorsky) (pp. 49–71; Eng. abs., p. 71); Hybrids of the Bison American × Bison European Crossed with Grey Ukrainian and Crossbred Simmenthal Cattle, by I. S. Zhuravok (Jouravok) (pp. 72–88; Eng. abs., p. 87); Morphological Analysis of the Skulls of Young Bovinae at their Hybridization, by S. N. Bogoliubskii (Bogolubsky) (pp. 89–111; Eng. abs., pp. 110, 111); Morphological Analysis of the Skulls of Adult Hybrids and the Initial Forms, by E. G. Andreeva (pp. 112–136; Eng. abs., pp. 135, 136); The Problem of Sterility of Hybrids, by A. V. Kukarkin and I. M. Khudiakov (Hudiakov) (pp. 137–143; Eng. abs., pp. 142, 143); Sex-linked Characters in Hybrids of the Musk Duck and Haki Duck, by I. I. Sokolovskaia (Sokolovskaya) (pp. 144–156; Eng. abs., pp. 155, 156); Results of Tests with Dilutors for the Sperm of Fowls, by IU. M. Ogorodni (J. M. Ogorodny) pp. 157–164; Eng. abs., p. 164); and Experiments of Distant Hybridization of Fowls with the Use of Artificial Insemination, by I. I. Sokolovskaia (Sokolovskaya) (pp. 165–176; Eng. abs., p. 176).

The origin of the JK strain of inbred mice: Twenty-two generations of mice without cancer, L. C. STRONG (*Jour. Heredity, 28 (1937), No. 1, pp. 41, 42, figs. 2*).—The JK strain of mice originated by crossing a strain of mice carrying genetic factors for pinkeye, brown, agouti, short ear, and kinky tail with another strain carrying pinkeye, blue dilution, brown, and nonagouti. This strain was continued by brother and sister matings for 27 generations without the appearance of a single case of mammary carcinoma, and only one case of carcinoma of the lung occurred.

Hereford hogs, A. L. ANDERSON and J. C. BONSMA (*Jour. Heredity, 28 (1937), No. 2, pp. 63, 64, fig. 1*).—Description is given from the Iowa Experiment Station of a breed of hogs marked like Hereford cattle and having two record associations. Evidently Duroc Jerseys and Chester Whites were used principally as foundation stock.

Animal breeding plans, J. L. Lush (*Ames, Iowa: Collegiate Press, Inc., 1937, pp. VIII+350, figs. 41*).—The principles of animal breeding and genetics are taken up under the following major headings, to which sections of the book are devoted: Background of animal breeding; genetic principles; breeding plans based on (1) selection, (2) relationship, and (3) somatic likeness; other topics concerning breeding plans; and topics relating to reproduction. Special attention is given to the practical application of genetic principles to breeding problems.

Linkage studies with curly$_2$ in the rat, C. T. Blunn and P. W. Gregory (*Jour. Heredity, 28 (1937), No. 1, pp. 43, 44*).—Linkage studies indicate that curly$_2$ (E. S. R., 75, p. 324) is not linked with the genes for agouti, hooded, dilute, hairless, kinky, albinism, and pinkeye in the rat. As CU_2 is independent of CU_1, it is considered the marker of a seventh chromosome. About twice as many pink-eyed as P progeny were obtained in the backcross, but no explanation was presented for this situation.

Linkage studies of the rat (Rattus norvegicus), II, H. D. King and W. E. Castle (*Natl. Acad. Sci. Proc., 23 (1937), No. 2, pp. 56–60*).—Continuing these studies (E. S. R., 74, p. 21), data are presented from F_2 and backcross progeny from matings between albino waltzing mice and colored nonwaltzers which showed linkage between the waltzing gene and albinism, and the waltzing gene and the gene for yellow.

Further backcross progeny also showed a higher percentage of waltzers among the albinos than among the colored individuals. Due to normal overlaps there was an excess in the number of nonwaltzers over waltzers, 1,581 to 558, but the sum of the crossovers, albino nonwaltzers (685) plus the colored waltzers (271) was 44.7±0.7 of the total population of 2,139.

The order of the four genes in this linkage group is suggested as color at one end of the chromosome, red-eyed yellow 0.3 unit away, with the pink-eyed yellow gene 20 units and the waltzing gene 45 units distant at the other end of the chromosome.

The genetics of tumour formation in mice in relation to the gene T for brachyury, A. M. Cloudman and C. C. Little (*Jour. Genet., 32 (1936), No. 3, pp. 487–504, figs. 2*).—Study was made of the relation of the incidence of mammary and nonmammary tumors to the brachyuric T gene in mice by crossing females from the *dba* strain having a high mammary and a low nonmammary tumor incidence with males from the Zavadskaia stock (some brachyuric) having low mammary and high nonmammary tumor incidence. The F_1 males were crossed with a third strain free from mammary and having a low incidence of nonmammary tumors. No significant difference in the occurrence of the tumors in the brachyuric and normal virgin females was noted. On account of the development of mammary tumors in 76.68 percent of the females of the F_1 generation the action of dominant factors is suggested, but only 5.66 percent developed tumors in the progeny produced by mating the F_1s to the low tumor strain. These results indicate that tumor incidence is not a simple Mendelian phenomenon and point toward the operation of extrachromosome factors.

The genetic basis for resistance and susceptibility to Salmonella aertrycke in mice, H. O. Hetzer (*Genetics, 22 (1937), No. 2, pp. 264–283, figs. 2*).—Results are reported from the Iowa Experiment Station on the increased resistance of mice to inoculation with standard doses of *S. aertrycke* during eight generations after the sixth generation continued from survivors of Schott's strain (E. S. R., 67, p. 120). The mortality in successive generations continued to decrease to the point where it seemed advisable to use larger doses

of the pathogene to bring about selection of animals with a higher concentration of genetic factors for resistance.

In reciprocal crosses with susceptible stock males of the resistant stock produced progeny with less susceptibility to the disease than the corresponding progeny of females selected from the resistant strain. This disproved the transmission of acquired immunity, as males are not known to transmit passive immunity to their offspring.

Inbreeding increased to over 80 percent in the thirteenth and fourteenth generations, but the degree of inbreeding was in no way associated with the mortality of the progeny of individual matings and there were marked differences in the ability of the progeny of different parents to survive. Mortality of the progeny from different matings in the twelfth and thirteenth generations ranged from 0 to 88 percent.

Age and weight were not important factors in resistance, although males were slightly more susceptible than females. There were differences in the mortality of the progeny from reciprocal crosses, but the total mortality of the F_1 progeny of the resistant × two susceptible stocks was 17 percent, nearly as low as the mortality of the resistant stock.

Mortality in the backcross generation to the susceptible strain was about 50 percent. Significant differences in the mortality of reciprocal backcrosses to one susceptible strain suggested a cytoplasmic influence, but in general dominant multiple genetic factors were principally responsible. A mortality of 80 percent, below that of both susceptible stocks, was observed among the F_1 progeny of these stocks, suggesting the complementary action of genes for resistance. There was no evidence of linkage of resistance with several genes for color.

Does the blood contain factors which reflect inherited characteristics? (*Wisconsin Sta. Bul. 438 (1937), pp. 43–45*).—Reference is made to studies by M. R. Irwin and by Irwin and L. C. Ferguson of differences between the blood of species of disease-resistant birds and animals (E. S. R., 76, p. 319) and differences in the blood of individuals which have and have not recovered from abortion.

The lethal nature of flightlessness in the fowl, D. C. Warren (*Jour. Heredity, 28 (1937), No. 1, pp. 17, 18, fig. 1*).—Further data are presented on flightless fowls (E. S. R., 69, p. 31) to suggest that the so-called flightless birds were heterozygous. In the F_2 such birds were approximately twice as numerous as normals. However, a few featherless birds with abnormal beaks and toenails were produced in the F_2 generation. Although they were less than 25 percent of the population, it is suggested that such represent birds homozygous for the flightless gene, which proved, in the main, lethal. A large number of homozygous birds were thought to die, and those raised beyond six months did not show inclination to mate or develop normal secondary sexual characteristics.

Study of reproductive processes in dairy cattle casts light on breeding troubles (*Wisconsin Sta. Bul. 438 (1937), pp. 46, 47*).—Brief results are reported by L. E. Casida and W. G. Venzke on changes in the uterus of dairy cattle following calving and the development of follicles in the ovaries preceding ovulation.

The influence of low temperature on embryonic development in the bat [trans. title], M. Eisentraut (*Biol. Zentbl., 57 (1937), No. 1–2, pp. 59–74, figs. 3*).—In three series of experiments it was shown that the rate of development of the bat embryo in utero was closely related to the surrounding temperatures.

The anatomy of the male genital ducts in the fowl, J. C. Gray (*Jour. Morph., 60 (1937), No. 2, pp. 393–405, pls. 4*).—A description of the microscopic anatomy of the tubuli contorti, tubuli recti, rete testis, ductuli efferentia, and epididymal ducts of the testes, and the vas deferens in male fowl.

Weights and linear dimensions of the skull and some of the long bones of the skunk (Mephitis mesomelas avia), H. B. Latimer (*Jour. Morph., 60 (1937), No. 2, pp. 379–391, fig. 1*).—Measurements and weights on skulls and 6 long bones from 74 male and 69 female skunks were in nearly all cases greater in the males than in females. There were relatively high correlations between the weight and the length of the skull bones and the corresponding measurements of the other bones.

The physiology and pharmacology of the pituitary body, H. B. Van Dyke (*Chicago: Univ. Chicago Press, 1936, pp. XVII+577, figs. 55*).—A summary of the literature of the action on various parts of the body of the hormones of the pituitary, including especially the growth-promoting and gonadotropic hormones, galactin, and related work on the action of other hormones, such as oestrin, progesterone, and prolan, and various glands of internal secretion. The extensive bibliography lists 3,031 references.

The modification of sex development in the chick embryo by male and female sex hormones, B. H. Willier, T. F. Gallagher, and F. C. Koch (*Physiol. Zool., 10 (1937), No. 1, pp. 101–122, pls. 2, figs. 14*).—A more detailed account of experiments previously noted (E. S. R., 76, p. 778).

[Relation of hormones to reproduction], I. A. Remezov (I. Remesow) (*Arkh. Biol. Nauk [Leningrad], 41 (1936), No, 3, pp. 33–90; Ger. abs., pp. 152–154*).—Brief abstracts are presented in German of the Russian papers dealing with the standardization and dosage of female sex hormones; the principle of the synthesis of sex hormones from sterines and cholic acid—theoretical foundations and the possible methods of the synthesis of the hormone of the corpus lutea (luteo-sterone), the follicular hormone (folliculo-sterone), and male sex hormones; and the nomenclature of the sex hormones.

The assay of transdehydroandrosterone and its effects on male and female gonadectomized rats, V. Korenchevsky and M. Dennison (*Biochem. Jour., 30 (1936), No. 8, pp. 1514–1522*).—Studies with synthetically prepared transdehydroandrosterone showed the effects of this hormone to be small when administered to normal and gonadectomized male and female rats.

An extract from the adrenal gland causing luteinisation of the ovaries and endometrial hyperplasia, R. Allen and G Bourne (*Austral. Jour. Expt. Biol. and Med. Sci., 14 (1936), No, 1, pp. 45–50, figs. 7*).—Extracts of adrenal tissue from kangaroos and cows were found to cause luteinization and uterine hypertrophy similar to that induced by the anterior pituitary-like hormone when injected into immature female rats. Cortin injections over long periods had similar luteinizing effects but caused less uterine hypertrophy.

The progesterone-like action of testosterone and certain related compounds, M. Klein and A. S. Parkes (*Roy. Soc. [London], Proc., Ser. B, 121 (1937), No. 825, pp. 574–579, pl. 1*).—In experiments with immature rabbits progestational proliferation of the uterus was induced by methyltestosterone, methyl- and ethyl-dihydrotestosterone and methyl- and ethyl-androstanediol. Testosterone showed some and androstenedione slight activity. These male hormone compounds were active even after removal of the ovaries.

The effect of a lysine deficient diet on the estrous cycle, P. B. Pearson (*Amer. Jour. Physiol., 118 (1937), No. 4, pp. 786–791, figs. 3*).—In studies at the California Experiment Station, oestrous cycles which ceased in the rat on a diet containing 18 percent gliadin as the chief protein were restored when 0.6 percent of *d*-lysine dihydrochloride was added to the ration.

Castration in the rat with and without removal of the epididymides, J. J. LAWLESS (*Anat. Rec., 66 (1936), No. 4, pp. 455–473*).—Castration of rats by removal of the testes and leaving the epididymides intact had the same influence on the growth and development of the animals and various organs and bones as ordinary castration with the removal of the testes and epididymides. The results were based on rats castrated at 21 to 23 days of age and autopsied at 88 to 109 days of age.

Testicular heterotransplantation in rats and mice, L. G. BROWMAN (*Jour. Expt. Zool., 75 (1937), No. 2, pp. 283–311, pls. 2*).—Autotransplantation of testicular tissue to the scrotum of rats and mice permits continued spermatogenesis and the production of sufficient male hormone to maintain normal secretory epithelium in the seminal vesicles. Portions of or the entire grafts underwent calcification, especially in the heterotransplanted tissue, and the seminal vesicles of such hosts were of the castrate type. There was no evidence of significant production of male hormone in heterotransplants, even after special treatment to aid in the adaptation of such tissue and the liberation of the male hormone.

The cause of reduced litter size in mice after X-raying the sperm [trans. title], P. HERTWIG and H. BRENNEKE (*Ztschr. Induktive Abstam. u. Vererbungslehre, 72 (1937), No. 3–4, pp. 483–487, figs. 2*).—Reduced litter size in mice mated with males treated with varying doses of X-rays was attributed to abnormalities in the process of development of the fertilized ova. Several nucleoli were formed in the fertilized cell and division was irregular. The X-ray treatment of the males accordingly reduced the litter size from an average of 5.69 to about 2 to 3. The proportion of the ova showing abnormal development was related to the size of the X-ray dose.

Analysis of variation in the sexual cycle and some of its component phases, with special reference to cattle, A. B. CHAPMAN and L. E. CASIDA (*Jour. Agr. Res. [U. S.], 54 (1937), No. 6, pp. 417–435, figs. 2*).—Based on an analysis of 690 oestrous cycles in normal dairy cattle, the Wisconsin Experiment Station found that individuality was an important cause of variations and there was a definite tendency for successive cycles in the same individual to be of similar length. Copulation without conception prolonged the next cycle about 4 days. As age increased there was a slight but significant increase in the length of the cycle with a reduced amount of variation. Significant seasonal differences in the duration of the cycles were noted. Successive periods between parturition and oestrous in the same individual tended to be of similar lengths. Related data on the sexual cycle and its component phases in the sheep, pig, horse, monkey, man, and baboon are discussed in connection with the interpretations.

Light and the sexual cycle of game birds, L. B. CLARK, S. L. LEONARD, and G. BUMP (*Science, 85 (1937), No. 2205, pp. 339, 340*).—In studies at the New York State Game Farm and Union College, continuous lighting beginning February 10 brought grouse into laying about one month earlier than in case of the controls. By keeping grouse and pheasants in the dark from February 10 to June 20, egg laying was prevented. Continued light did not prevent retrogression of the gonads after the conclusion of the breeding season. Stimulation of immature and adult males was effected by hypophyseal extracts, leading to the conclusion that the light acts through the hypophysis.

A double sheep pregnancy with a single corpus luteum, W. L. HENNING (*Jour. Heredity, 28 (1937), No. 2, pp. 61, 62, fig. 1*).—Among 675 sheep fetuses examined for sex at the Pennsylvania Experiment Station, two fetuses about 130 days in age were found with joined allantoic membranes and with a single

corpus luteum in the ovaries. This is therefore suggested as a case of monozygotic twinning.

Some observations upon the mitotic and meiotic divisions in the Wistar rat.—III, Effects produced by experimental cryptorchidism, W. BRYDEN (*Cytologia, 7 (1936), No. 4, pp. 499–503, figs. 4*).—Continuing this series (E. S. R., 76, p. 777), differences in the late prophase and metaphase stages of cell division were noted as a result of placing the testes of rats in the abdominal cavity for from 12 to 28 days, yet the chiasma frequencies did not appear to be affected by the increased temperature. The meiotic and mitotic divisions showed little change as compared with that observed in other animals as a result of cryptorchidism.

Hermaphroditism in goats, S. A. ASDELL (*Dairy Goat Jour., 14 (1936), No. 10, pp. 3, 4*).—A description of hermaphroditism in goats with reference to the fact that all observed hermaphrodites are hornless.

FIELD CROPS

The effect of electric current on certain crop plants, C. S. DORCHESTER (*Iowa Sta. Res. Bul. 210 (1937), pp. 37, figs. 9*).—The possible effects of weak electric currents, similar to those existing in nature, upon crop plant growth and certain phases of the environment were studied in experiments using the earth-air currents collected and discharged by means of elevated metal brushes, and using currents generated as the result of differences in potential between buried, aerially connected, copper and zinc electrodes, sometimes augmented by dry cells placed in the circuits. In both types the currents developed were applied to the root areas of the plants.

Currents obtained by installation of elevated metal brushes connected with buried wires transversing the root areas of field crops apparently had little effect on yields of corn, soybeans, turnips, string beans, chard, and beets, the last two making the largest increases. Currents passing through elevated metal brushes during fair weather changed direction frequently and were of the order of from 5×10^{-10} a to 1×10^{-9} a, but varied greatly during unsettled weather both in direction and magnitude, the highest value being of the order of 200×10^{-9} a. Intensities of currents measured in the soil and along the buried conductor at various distances from one of the elevated brushes seemed to bear no relation to intensities measured where the conductor entered the soil.

Application of currents ranging in intensity from 7,000 to 20,000 v to roots of oats in greenhouse flats did not produce significant variations in yields of grain and straw. Greenhouse treatments in which an electrode of copper and one of zinc were buried at opposite ends of the test soil area and connected aerially by copper wire produced significant increases in yields of oats in the first year of the experiment. Currents measured were of the order of from 0.5 to 1.5 ma. In the second year the grain and straw yields were not increased by treatment with electric current, while root yields were decreased significantly. In this test one or two dry cells were included in the circuit for each treated lot, and current intensities ranged as high as 4 ma. In field trials with oats the copper-zinc electrodes combination, with dry cells included in the circuits, provided current intensities ranging from 2 to 55 ma but failed to affect yields significantly, and apparently did not affect the percentage of total nitrogen of oats.

Except in determinations made in connection with the field tests, a rather definite relationship between electrical treatment and numbers of soil microorganisms was observed throughout the series of experiments. In the 1932

greenhouse experiment, comparison of 24 samples showed increases for the electrically treated lots of from 14 to 123 percent and for 20 samples in 1933 of from 15 to 23 percent. Further proof was provided by the carbon dioxide determinations, a weak current of 0.1 ma producing appreciable increases in amounts of carbon dioxide formed and a relatively strong current of from 10 to 15 ma resulting in pronounced decreases.

A humidity- and temperature-control cabinet for growing plants, C. O. Grandfield and F. J. Zink (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 7, pp. 503–508, figs., 3*).—The cabinet for the control of humidity and temperature, for use in agronomic experiments with plants growing under glass and exposed to natural light, developed by the Kansas Experiment Station in cooperation with the U. S. Department of Agriculture (E. S. R., 75, p. 769), is described in further detail. The relative humidity is controlled by use of an aqueous solution of sulfuric acid in the inner chamber of the cabinet, and temperature is controlled entirely by radiation through the glass into the inner chamber. Use of the cabinet may be extended to studies with soil-moisture control.

[Field crops experiments by the Storrs Station] (*[Connecticut] Storrs Sta. Bul. 214* (*1937*), *pp. 7–10*).—Brief reports are again (E. S. R., 75, p. 194) given on the effects of time and frequency of cutting alfalfa under different fertilizer treatments; the effects on alfalfa of amount and depth of application of limestone; the effects of fertilizer treatments on the soil, flora, and production of permanent pastures; response of pasture species to plant nutrients; the adaptability of varieties and species of grasses and clover for pastures; and fertilizer experiments (involving lime and magnesia) with potatoes.

[Experiments with rice and other crops in Louisiana, 1935–36], J. M. Jenkins (*Louisiana Sta., Rice Sta. Bien. Rpt. 1935–36, pp. 4–12*).—Agronomic research with rice (E. S. R., 73, p. 462), continued in cooperation with the U. S. D. A. Bureau of Plant Industry and reported on briefly for 1935 and 1936, included variety, date of seeding with grain drill and in water, date and manner of submergence tests, rice rotations, and studies of the effect of holding water on rice lands in alternate years when not sown to rice. Breeding work is reviewed in a special article, Progress in Improving Rice Varieties, by N. E. Jodon (pp. 10–12). Work with other crops included variety tests with cotton, corn, and soybeans; fertilizer tests with cotton; date of planting tests with corn, grain sorghums, and sorgo; a cotton and corn rotation; and a permanent pasture experiment.

[Field crops work in New Jersey] (*New Jersey Stas. Rpt. 1936, pp. 28–32, 69, 70, 96*).—Progress reports are again made on agronomic research (E. S. R., 75, p. 616), including breeding work with corn, rye, barley, fescue, bentgrass, and alfalfa; variety tests with corn, wheat, oats, barley, seed flax, soybeans, and annual hay crops; planting tests with oats; fertilizer experiments with potatoes (including placement tests); increasing the protein content of timothy by nitrogen fertilization at heading; pasture experiments; experiments on establishing and maintaining turf, including studies on the rate of penetration of lime on permanent sod, and the seasonal fluctuation in supplies of available plant food under a variety of conditions; experiments with winter green manures (E. S. R., 76, p. 324); and studies on the relation of fungi to seed germination, on abnormalities in the germination of beans, and on the longevity of agar cultures of rhizobia.

[Field crops research in Wisconsin, 1935–36] (*Wisconsin Sta. Bul. 438* (*1937*), *pp. 65–72, 73–81, 82–86, 93–97, 99, 100, figs. 7*).—Agronomic investigations (E. S. R., 75, p. 475) for which progress is reviewed in these pages were concerned with the merits of seed from hybrid corn for planting, by N. P. Neal;

the introduction of identifying color factors into hybrid corn, by R. A. Brink and Neal; studies of the effect of color on corn yield; improvement in the design of the bin drier for seed corn, by A. H. Wright and F. W. Duffee, and the development of a slatted floor drier; a study of grades for shelled corn, by Wright; comparison of yields of rye, barley, oats, and winter and spring wheat at several branch stations, and of the yields of corn, sunflowers, and rutabagas for silage at the Ashland Substation, all by E. J. Delwiche; comparison of barley varieties for malting quality, by J. G. Dickson et al.; the use of small, light combines for harvesting reed canary grass seed, by E. D. Holden, and the palatability of canary grass for cattle; pasture management research near Fort Atkinson, including studies on the value of various pasture grasses, especially Sudan grass, by O. S. Aamodt, F. Boyd, and E. Truog; the response of bluegrass pasture to nitrogen fertilization and rotational grazing in studies at the station, by G. B. Mortimer, I. W. Rupel, Aamodt, and H. L. and G. H. Ahlgren; the determination of pasture yields through actual grazing, by Rupel, G. Bohstedt, Aamodt, H. Ahlgren, and E. J. Graul; the reduction of grub infestation by renovation of old bluegrass pastures with legumes, by R. F. Fuelleman and L. F. Graber; the development of nonbitter sweetclover, by W. K. Smith, Brink, W. L. Roberts, and K. P. Link; the smothering effect of ice sheets on alfalfa, by V. G. Sprague and Graber; causes of seed failure in alfalfa, by D. C. Cooper and Brink; the development of improved winter-hardy and wilt-resistant varieties of alfalfa, by Brink and F. R. Jones; the superiority of potatoes grown on peat land over those from other types of soil, variety and planting tests with oats on peat land, and cultivation experiments with corn on sandy lands at Hancock, all by A. R. Albert; blackening of potatoes during cooking attributable to lack of potassium and possibly deficiency in one of the less common elements, by W. E. Tottingham, A. F. Ross, and R. Nagy; fertilizer experiments with potatoes at Ashland and Spooner, by F. L. Musbach; and potato breeding and improvement, by G. H. Rieman. A number of the investigations were in cooperation with the U. S. Department of Agriculture.

British grasses and their employment in agriculture, S. F. Armstrong (*Cambridge, [Eng.]: Univ. Press; New York: Macmillan Co., 1937, 3. ed., pp. [XI]+350, figs. 194*).—Part 1 of this revision and enlargement of a book noted earlier (E. S. R., 40, p. 525) describes and illustrates native species. Part 2, the agricultural section, deals with the choice and cultivation of grasses as crops, incorporating results of recent research on grasses and grassland, and includes a chapter on lawns and greens.

High-grade timothy and clover hay: Methods of producing, baling, and loading for market, E. O. Pollock and W. H. Hosterman (*U. S. Dept. Agr., Farmers' Bul. 1770 (1937), pp. II+17, figs. 4*).—Practical information is given on the importance of timothy and clover hay as a hay crop in the United States; on its quality as affected by time of cutting and maturity at cutting, weather damage, fermentation, and content of foreign material; on how to produce high-quality hay by good stands, proper curing and storage methods, and minimizing rain damage; and on the preparation of hay for market and loading it on cars or trucks.

An all-year pasture system for Missouri, W. C. Etheridge, C. A. Helm, and E. M. Brown (*Missouri Sta. Circ. 193 (1937), pp. 12, figs. 3*).—This is a revision of circular 186 (E. S. R., 73, p. 604).

Dry-land crops at the Tucumcari Field Station, D. R. Burnham and J. S. Cole (*New Mexico Sta. Bul. 244 (1936), pp. 48, figs. 10*).—Experimentation in growing field crops on dry land in cooperation with the U. S. Department of Agriculture is reported for the period 1929–35, supplementing previous work

(E. S. R., 62, p. 32). Descriptions of climatic and other environmental conditions are included, and suggestions are made for the control of soil blowing (E. S. R., 76, p. 27).

The better adapted crops include grain sorghum, sorgo, broomcorn, cowpeas, beans, and peanuts. Crops following pinto beans in rotation have yielded about as much as on fallowed land. Cowpeas returned good yields of excellent hay, and crops after cowpeas outyielded those following sorghums or corn. Cowpeas or beans, if grown on sandy soil, should be planted in narrow strips, alternating with strips of crops not conducive to soil blowing during winter and spring after harvest. Fallowing has not increased the yields of following crops enough to be economical, and fallow land is subject to blowing. Listing, preceded by early spring cultivation to prevent soil blowing and to kill early weeds, has been practical for planting row crops. Barnyard manure, but not green manure, has increased yields of succeeding crops. Crop rotation, especially when including cowpeas or beans, is preferable to continuous planting.

Dwarf Yellow milo and certain of the dwarf, upright, early, combine-type milo-kafir hybrids are preferred for grain production, and Sunrise has been the best kafir for bundle feed. Dwarf hegari has produced well in favorable years, but erratically in dry years. Sumac sorgo combines high yield with good quality feed, but produces much less seed than Kansas Orange and Sourless, which mature earlier and yield about 80 percent as much total tonnage. Broadcasted or drilled sorghums averaged lower in yield than sorghums planted in rows. Broadcasted kafir or sorgo is suitable for irregularly shaped areas in contour plantings. Sudan grass, excellent for summer pasture, should be planted in rows for either hay or pasture and as late as early August as a catch crop or on sandy land where soil blowing is troublesome. Its hay is good but it yields much less than that of the better sorgos. Scarborough is the best broomcorn variety tested. The crop, if the stalks are not grazed, is valuable in preventing soil blowing on light land.

Spanish peanuts mature early and have been among the highest yielders of nuts. The later-maturing Virginia Runner and Virginia Bunch produce more hay but will not mature fully if planted later than May 15. Blue grama, bromegrass, and crested and slender wheatgrasses have made stands only under exceptionally favorable conditions. Alfalfa and sweetclover have been planted successfully in rows on undisturbed drilled sorghum stubble, and on well-chosen sites alfalfa may produce enough hay, seed, or pasture to be profitable.

The time factor in pollen-tube growth and fertilization in barley, M. N. Pope (*Jour. Agr. Res. [U. S.], 54 (1937), No. 7, pp. 525–529, pls. 2, fig. 1*).—Pollen germinated within 5 min. after reaching the stigma in Hannchen barley (*Hordeum distichon palmella*) under the greenhouse conditions as described. The male gametes had entered the pollen tube within 10 min. and had reached the level of the micropyle in 40 min. Within 45 min. the two male gametes had entered the egg sac through the micropyle and one had reached or entered the egg nucleus and the other, one of the polar nuclei. The fusion nucleus produced division figures and daughter endosperm cells within 6 hr. after pollination. Division figures were present in the fertilized egg at the 14-hr. stage, at which time from 6 to 8 naked, rapidly migrating endosperm cells were in the ovule. The first division of the fertilized egg was completed within 15 hr. after pollination.

Analysis of covariance of yield and time to first silks in maize, G. W. Snedecor and G. M. Cox (*Jour. Agr. Res. [U. S.], 54 (1937), No. 6, pp. 449–459,*

figs. 2).—An analysis of the covariance between yield and time to first silks among inbred lines and 14 varieties of corn, considered by Jenkins (E. S. R., 62, p. 420), was made at the Iowa Experiment Station. The 14 variety regressions of yield on time to first silks did not differ significantly among themselves, presenting no evidence against the hypothesis of a common regression in all the inbred lines. The average within-variety regression differed significantly from that between-variety means, showing that variety mean yields do not respond to variety earliness in the same manner as the yields of inbred lines respond to their earliness. The variety means departed significantly from their regression, emphasizing this finding. A convenient method for averaging the correlation coefficients of the 14 varieties and an easy test appropriate for field plat trials are included.

Effects of age, size, and source of seed on the corn crop, T. A. Kiesselbach (*Nebraska Sta. Bul. 305 (1937), pp. 16, figs. 4*).—Results of experiments bearing directly on questions most common under conditions of seed scarcity are reported. See also earlier notes (E. S. R., 45, p. 230; 49, p. 225).

New seed corn is preferred to old seed, although seed up to 4 yr. old when well preserved and of strong germination has proved satisfactory. Small but sound ears and kernels, stunted by drought, can be used as seed. In years of late maturity, seed corn may be harvested 1 or 2 weeks before fully ripe without impairing seed value if properly cured. Home-grown seed of recognized established varieties should be given first choice, although suitable seed may be introduced from a distance. When grown comparably at Lincoln, corn from extreme southeastern Nebraska ripened 11 days after corn from northeastern Nebraska, and a month later than that from the extreme southwestern panhandle section of the State. Regional strains from various parts of the United States, which required less than 100 days to ripen at Lincoln, averaged 676 sq. in. of leaf area per stalk, while those requiring more than 140 days averaged 2,027 sq. in. The water needed in normal growth of corn has been found to increase with vegetative size and lateness of ripening. If seed of open-pollinated varieties is to be brought to eastern Nebraska from other States, the most suitable sources appear to be points in Iowa and Illinois. of about equal or slightly more northern latitude. Seed from northern Ohio and southern Wisconsin and Michigan might be usable in central Nebraska in an emergency. Short-season plains States may be considered as out-of-State seed sources for western Nebraska.

In general, within a locality in Nebraska seed corn may be interchanged without respect to the soil fertility level. Irrigated seed corn from central and western Nebraska may be moved a considerable distance to dry land east or south, but may prove too large and late for dry land in the same locality. In contrast with open-pollinated varieties, the adaptation of any specific corn hybrid is unaffected by locality or condition under which the seed is produced, depending entirely upon the component inbred lines.

Fertilizers for cotton on the Red and Mississippi River alluvial soils of Louisiana, H. C. Lovett and F. L. Davis (*Louisiana Sta. Bul. 284 (1937), pp. 8, fig. 1*).—In cooperative fertilizer tests with cotton, 1927–36, on Red River (Miller and Yahola very fine sandy loams) and Mississippi River (Sarpy very fine sandy loam and Sharkey clay loam) alluvial soils, yield increases followed application of nitrogen and phosphorus but not potassium. From 30 to 42 lb. of nitrogen per acre have given the most profitable increases on all soils, and can be supplied by applying 200 lb. of fertilizers containing from 15 to 20 percent nitrogen. On soils in which cropping is depleting reserves of available phosphorus, profitable increases will be obtained from using about

24 lb. of phosphoric acid per acre, to be supplied by 300 lb. of a 12–8–0 mixture. Net profits from various treatments are shown.

Fertilizers for cotton on the Coastal Plain soils of Louisiana, F. L. Davis and H. C. Lovett (*Louisiana Sta. Bul. 285 (1937), pp. 10, figs. 2*).—Results of cooperative fertilizer tests with cotton, 1927–36, suggest the use of 300 lb. per acre of 8–8–8 fertilizer on the hill (Orangeburg, Ruston, Greenville, and Bowie fine sandy loams) and upland valley (Kalmia and Ochlockonee very fine sandy loams) soils and 400 lb. per acre of 6–10–7 fertilizer on the loessial bluffs (Granada silt loam) and flatwoods soils (Caddo very fine sandy loam) east of the Mississippi. Net profits from various treatments are shown.

Fertilizers for cotton on the prairie soils of southwest Louisiana, H. C. Lovett and F. L. Davis (*Louisiana Sta. Bul. 286 (1937), pp. 8, figs. 2*).—Cooperative fertilizer tests with cotton, 1928–36, on prairie soils in southwest Louisiana (Crowley silty clay loam, Crowley silty clay, and Olivier silt loam) show decided response to potassium, especially in combination with nitrogen and phosphorus. Application of as much as 600 lb. of 4–8–6 fertilizer is advised except in areas where cotton is damaged excessively by rust, where a 4–8–10 mixture should be used. Net profits from various treatments are shown.

Good varieties of cotton for Missouri, B. M. King (*Missouri Sta. Circ. 194 (1937), pp. 8, fig. 1*).—Cotton varieties indicated for Missouri conditions from results of tests at Sikeston on Lintonia silt loam and in cooperation with farmers on other soil types included Delta and Pine Land (Deltapine) 11 and 11A and Stoneville 5 and 5A for a wide range of soil conditions (except very fertile soils), Stoneville 4A (Ambassador) for very fertile soils and for late planting and planting along the northern limits of cotton culture on most soils where wilt and rust are not serious, and Arkansas Rowden 40 for sandy soils where wilt and rust commonly occur. Desirable features in a variety, varietal deterioration, and other factors in producing good cotton crops are discussed briefly.

Cotton varieties grown by Tennessee farmers, with regional comparisons, C. E. Allred, P. B. Boyer, G. H. Hatfield, N. J. Stanford, and B. D. Raskopf (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 35 (1937), pp. [1]+III+39, figs. 19*).—Data were obtained from an average of 404 gins per season from 1928 through 1933, the survey covering 91 percent of the gins and 98 percent of the production of the State. The varieties grown per county and per gin, the ginnings of different varieties, predominant varieties in different counties and geographic districts, the mixing of seed in ginning, renewal of seed supply, improvement of varieties, etc., are discussed.

Thirty-seven recognized varieties were reported from 1928 through 1933, 19 varieties being grown in one county in 1929. The number of varieties per gin most commonly reported was five. Less than 2 percent of the growers confined their efforts to the systematic production of one variety. From 1931 through 1933 the number of varieties decreased in seven counties and increased in one. The two varieties most extensively grown were Delta and Pine Land and Half and Half. The production of the Delta and Pine Land variety increased from 11.4 percent of the total production in 1928 to 35 percent in 1932. The production of Half and Half decreased from 46 to 23 percent of the total production. In 1928, 7.6 percent of the total cotton plantings were from pedigreed seed. The percentage in 1933 was two.

Soybean projects of the State agricultural experiment stations, 1937, compiled by H. M. Steece (*U. S. Dept. Agr., Off. Expt. Stas., 1937, pp. [2]+17*).—Superseding a similar publication (E. S. R., 75, p. 195), this lists by experiment stations the titles, leadership, and station departments of 245 currently

active research projects concerned with the production and utilization of soybeans.

Cane growth studies: The effect of sunlight on the utilization of nitrogen and potash by H 109 cane, R. J. Borden (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 41 (1937), No. 1, pp. 3–5*).—In further growth studies with sugarcane (E. S. R., 75, p. 774), H 109 cane was grown in pots in Manoa soil (low in available nitrogen and potassium) treated with ample phosphate and supplied with nitrogen fertilizer at rates of 0, 150, 225, and 300 lb. per acre (with 400 lb. of potash per acre), and 0, 200, 300, and 400 lb. of potash fertilizer (with 300 lb. of nitrogen). One series was grown continuously in full sunlight, a second received full sunlight from sunrise to midday only, and a third was exposed to full sunlight from midday to sunset only.

Differences between morning and afternoon sun were not demonstrated in the final results, although during the test indications were that plants receiving afternoon sun made more growth. Dry weights were greater from cane grown in full sunlight. When no nitrogen was supplied all growth was very poor and no apparent differences in dry weights were noted. While decided responses came from the first increments of nitrogen and of potassium, an apparent inability of plants grown under a reduced amount of light to use effectively the heavier applications of plant food was shown clearly. Plants grown in full sunlight appeared to be less succulent than either series grown under reduced light, and the percentage of moisture in the plants at harvest was influenced by fertilizer treatment, being the higher in canes receiving larger quantities of nitrogen and of potash. Practical suggestions from the results include the adjustment of fertilizer applications with respect to the expected and prevalent sunlight conditions that would be likely to affect each crop.

Sweet potato production in Louisiana, J. C. Miller and W. D. Kimbrough (*Louisiana Sta. Bul. 281 (1936), pp. 23, figs. 2*).—Seed and planting practices indicated from station experiments with sweetpotatoes include choice of the Porto Rico variety; treatment with corrosive sublimate solution of selected seed before bedding at the rate of from 6 to 8 bu. to provide plants for 1 acre; bedding in rows in the open for the main crop in south Louisiana; using vine cuttings rather than pulling slips when beds are in field rows; and setting plants, June 1–15, 12 in. apart in ridged rows from 12 to 14 in. high and from 3.5 to 4 ft. apart on sandy and silt loam soils receiving from 400 to 600 lb. per acre of 4–12–4 or 4–8–4 fertilizer. The crop should not be planted on the same land oftener than every other year. Two shallow cultivations are usually needed to control weeds.

Sweetpotatoes should be harvested before frost, usually best in October, avoiding bruising, grading the marketable potatoes carefully, and placing them in storage crates. In curing, sweetpotatoes should be kept at from 80° to 85° F. for from 10 to 20 days just after digging and from 50° to 60° after curing. In south Louisiana, artificial heat is not needed for roots harvested in October.

Distribution of the varieties and classes of wheat in the United States in 1934, J. A. Clark and K. S. Quisenberry (*U. S. Dept. Agr. Circ. 424 (1937), pp. 68, figs. 65*).—The distribution and acreages of classes and varieties of wheat are shown from surveys for the crop year 1934, based largely on the harvested wheat-acreage reported for the special agricultural census of 1935, and are compared with the distribution in 1919, 1924, and 1929 (E. S. R., 70, p. 771). The distribution of the more important wheats is shown on varietal maps, and estimated acreages and percentages of the total wheat acreage occupied by each variety or class in 1919, 1924, 1929, and 1934 are tabulated by States and for the United States.

The total acreage (harvested acreage in all but 12 drought States) in the United States in 1934 in round numbers was 61 million acres, somewhat higher than the 1924–33 average of slightly over 57 million acres, and compared with 51 million acres in 1924 and 62 million in 1929. In general, increases in acreages were reported in Ohio, Arkansas, and certain southeastern States, decreases in several Middle Atlantic States, increases in Arizona, Colorado, Kansas, Minnesota, and Texas, and decreases in Oklahoma, Oregon, and States in the northern Great Plains. Ceres, Blackhull, Fultz, Nebraska No. 60, Albit, Dawson, and Fulhio made the greatest increases in percentage of acreage during the 1929–34 period, and Marquis, miscellaneous durums, Pentad, Kanred, Turkey, and Goldcoin made the greatest decreases. Varieties grown on more than 1,000,000 acres listed in the order of importance included Turkey, Marquis, Blackhull, Ceres, Kanred, Fultz, Fulcaster, and Trumbull.

Chemical, milling, and baking results for wheat varieties grown in the cooperative varietal experiments in the western region in 1934, C. C. Fifield, C. E. Bode, B. B. Bayles, J. F. Hayes, R. Weaver, and A. Christie (*U. S. Dept. Agr., Bur. Plant Indus., 1936, pp. [1]+41, fig. 1*).—Representative samples of wheat varieties produced in cooperation with State experiment stations in field plats and uniform nurseries in the western region in 1934 were tested for milling value and for quality as determined by chemical and baking methods (bread, cake, and cookies), and, in addition, the dough-ball time and index of particle size were determined for part of the samples.

At several stations only a small range of protein content occurred between varieties, while at others, notably Bozeman, Mont., and Union, Oreg., the range was about 6.5 percent. In general, soft wheats were lower than those with hard vitreous grain. Carotene values were very high for the club wheat varieties, being for the most part in excess of 3 p. p. m. The dough-ball time test showed considerable variation, but generally the club and soft winter wheats had the lowest values, the higher values being associated with the varieties having hard vitreous kernels. The wheats of a vitreous type, such as hard white, hard red winter, and hard red spring, had low indices of particle size, which appear to be associated with grain producing a coarse, granular flour. The soft white and club wheats, normally producing flours soft and velvety to feel, had high indices of particle size.

With respect to the bread-baking test, Baart, Ridit, Kharkof, White Federation, and Turkey generally were highest in quality, while Golden, Rex, Fortyfold, Albit, Triplet, Federation, and Pacific Bluestem were low. The club wheats Hybrid 128, Jenkin, Albit, Hymar, and Union were of inferior quality and considered poorly adapted for bread. Marquis, grown in the Pacific Northwest, was usually of inferior strength. In general, the varieties having high baking values indicative of bread baking strength were also high in protein content. Certain exceptions are noted.

In the cake test, Baart, Hybrid 128, Golden, Triplet, Albit, Fortyfold, Irwin Dicklow, Onas, Pacific Bluestem, and Jenkin were high in quality, while the hard or more vitreous wheat selections as White Federation, Hard Federation × Dicklow, Florence × Marquis, Kharkof, Ridit, Ceres, and Marquis were inferior. Varieties giving the best results in the cookie test were Albit, Rex, Jenkin, Onas, Hybrid 128, Golden, Irwin Dicklow, and Federation. The hard wheats made very poor cookies.

Yams for Hawaiian gardens, II, E. L. Caum (*Hawaii, Planters' Rec. [Hawaii. Sugar Planters' Sta.] 41 (1937), No. 1, pp. 13–18, figs. 5*).—The merits of certain varieties of Chinese yam (*Dioscorea batatas*) are set forth, supplemental to an earlier note (E. S. R., 75, p. 776).

Seed inspection in Kentucky, 1934–1936, W. A. Price, E. C. Vaughn, E. Deen, J. Taylor, and A. Marrs (*Kentucky Sta. Regulat. Ser. No. 11 (1937), pp. 18*).—The purity, germination, and presence of excessive quantities of noxious weed seed are reported for 345 official samples of agricultural seed obtained July 1, 1934–June 30, 1936.

Summary of results of seed and legume inoculant inspection for 1936, J. G. Fiske (*New Jersey Stas. Bul. 623 (1937), pp. 23*).—The dealers in New Jersey from whom the 1,933 official samples of crop and vegetable seed and seed mixtures were collected in 1936 are listed with compliances and violations indicated; and the crops, inoculation, and number of organisms are shown for 46 official samples of legume inoculants.

HORTICULTURE

[Horticultural investigations conducted by the New Jersey Stations] (*New Jersey Stas. Rpt. 1936, pp. 37–40, 53–69*).—Among studies for which findings are reported are those dealing with cranberry fertilizers and harvesting, compatibility of pyrethrum insecticides with bordeaux mixture, fertilizers for blueberries, breeding of peaches, resistance of peaches to low temperature, rootstocks for peaches, effects of mineral deficiencies on peach trees, nutrient deficiency effects on the apple, breeding the apple, growth status of apple trees, strawberry breeding, strawberry culture and varieties, tomato and asparagus breeding, vegetable varieties, relation of lime and organic matter to tomato yields, varietal response of lima beans to nitrogen, lime requirements of vegetables, relation of sodium to calcium in the growth of the tomato, temperature requirements of tomato varieties, cause of bud-drop in gardenias, culture of roses, chrysanthemums, carnations, and snapdragons, the testing of chrysanthemums, phlox, iris, and dahlias, the relation of spray schedules to spray residue removal, and the development of more economical and effective methods of removing toxic residues from fruits.

[Horticultural investigations by the Wisconsin Station] (*Wisconsin Sta. Bul. 438 (1937), pp. 72, 73, 100–103*).—Brief popular reports are presented on pea-breeding investigations and the resulting varieties, by E. J. Delwiche; lima beans and tomatoes adapted to Wisconsin, by O. B. Combs; the protection of grapes by covering with soil, and varieties of black raspberries, both by J. G. Moore; mulching of strawberry beds, by R. H. Roberts; and culture of orchards, by L. Langford and Roberts.

Minor elements affecting horticultural crops, H. Hill (*Sci. Agr., 17 (1936), No. 3, pp. 148–153, figs. 7; Fr. abs., p. 153*).—In the case of turnips grown in sand culture, plants receiving no boron showed definite signs of disorder at the end of 6 weeks. Root growth was limited, and all roots became affected with hollow heart. To develop large healthy roots, 1 to 1.5 p. p. m. of boron were required. It was found that neither copper nor zinc could replace boron in the nutrition of the turnip. In the case of the tomato and potato, definite growth disturbances were observed where boron was absent from the nutritive solution. Blotchy-cork disease of apples growing in pots was controlled by boron. In work with tomatoes, chrysanthemums, strawberries, and turnips in sand cultures, copper was found to be an essential nutrient. In the absence of manganese, potato plants were stunted and their yields reduced. Zinc, uranium, and strontium were supplied to tomatoes in concentrations ranging from 0.01 to 0.5 p. p. m. without external results.

Propagation response from root cuttings planted with the proximal end projecting above the medium, W. H. Upshall (*Sci. Agr., 17 (1936), No. 3, pp.*

146, 147, fig. 1; Fr. abs., p. 147).—Not only was there a much better rooting response when the top or proximal ends of cuttings were planted so that 0.5 cm projected above the rooting medium, but top growth was also much more rapid and the cuttings that failed to develop did not rot as quickly as those which were completely covered. The improved rooting is ascribed either to the effects of light or aeration.

Evaporation studies.—I, A survey of evaporation and light values in greenhouses, J. D. Wilson (*Ohio Sta. Bimo. Bul. 186* (*1937*), *pp. 87–97, figs. 3*).—For the purpose of making a general survey of existing climatic conditions, atmometer readings were taken over a 12-mo. period in 31 widely distributed greenhouses varying greatly in construction, crops grown, etc. Evaporation was found greatest in July and at a low point in October, November, and December. Light values were low in December and January. Shading in summer reduced evaporation from the black atmometers by 22 percent and the intensity of light by 38 percent. Forcing heated air through the greenhouse increased evaporation approximately 50 percent above that of houses warmed in the ordinary manner.

The metabolism of fruit and vegetables in relation to their preservation, M. Copisarow (*Jour. Pomol. and Hort. Sci., 14* (*1936*), *No. 1, pp. 9–18*).—Maleic acid was found to inhibit ripening and germinating processes and parasitic activity in a variety of fruits and in the potato. The acid was more effective in an inert ethereal oil than in an aqueous medium. Ethereal extracts of apples, freed from the solvent and dissolved in inert esters, exert an inhibiting effect similar to that of maleic acid upon embryonic development and respiration of fruits and potatoes. The author considers it likely that maleic acid is identical with the natural inhibitor "blastokolin", and that the transition of this inhibitor into the accelerator is represented by the degradation of maleic acid into ethylene.

The vegetable gardener's how book, C. C. Sherlock (*New York: Macmillan Co., 1937, pp. XIX+286,* [*pls. 28*]).—With subject matter arranged alphabetically by plants, general information is presented on culture, varieties, harvesting, control of pests, etc.

Some observations on individual asparagus plant records, O. J. Robb (*Sci. Agr., 17* (*1936*), *No. 3, pp. 144, 145; Fr. abs., p. 145*).—Individual plant records taken by the Horticultural Experiment Station, Vineland, Ontario, on three lots of Mary Washington asparagus plants showed a range from 4 to 40 marketable stalks per plant per season. Counting all plants with less than 10 stalks as unprofitable, it was estimated that 39 percent of the plants were not in this class. There was a tendency for low or high production to be maintained through the years, and a high positive correlation was established between early yields and total yields. Crosses were made between high-yielding male and female plants in the hope of developing high-yielding progeny.

Garden beans, C. G. Vinson (*Missouri Sta. Circ. 195* (*1937*), *pp. 11, fig. 1*).—General information is presented on varieties, cultural requirements, control of insect and disease pests, storing of seed, and other matters.

Analytical observations on the changes of pectic substances and sugars in celery during cold storage, R. H. White-Stevens (*Sci. Agr., 17* (*1936*), *No. 3, pp. 128–136; Fr. abs., p. 136*).—Studies of Golden Self Blanching celery stored at 32° F. failed to show any well-defined correlation between pectic hydrolysis and storage maturity apart from the cytolytic effects of pathogenes. Sucrose increased markedly in the early part of the storage period, ultimately declining

[...]aneous increase in hexose, which in turn reached a maximum [...]ned. Basing food value on sugar content, it was suggested that, [...]e optimum storage period for celery at 32° is between 60 and [...] days, with a possibility that factors such as variety, cultural treatment, and harvesting may influence the sugar changes markedly.

The garden of gourds, L. H. Bailey (*New York: Macmillan Co., 1937, pp. [4]+134, pls. 42*).—General information is presented on the classification of gourds, desirable and distinguishing characteristics, and culture.

Varieties of cabbage lettuce and their classification, P. W. Brian (*Jour. Pomol. and Hort. Sci., 14 (1936), No. 1, pp. 26–38*).—Discussing some of the distinguishing characteristics of the various head lettuce varieties grown in England, the author presents a preliminary classification of varieties.

Breeding tip-burn resistant lettuce, I. C. Hoffman (*Ohio Veg. Growers Assoc. Proc., 21 (1936), pp. 96–98*).—Selections from commercial and other strains of Grand Rapids lettuce, growing in the greenhouses of the Ohio Experiment Station, yielded certain plants free from tipburn. Progenies raised from these plants were much more resistant than commercial stock, and those of one line, No. 7, were free from tipburn. Under adverse summer conditions in the field all strains developed some tipburn, but No. 7 was again selected for propagation because of superior qualities.

Irrigation experiments with the Early Grano onion, A. S. Curry (*New Mexico Sta. Bul. 245 (1937), pp. 39, figs. 12*).—Beginning about 6 weeks after transplanting, five different irrigation treatments were compared on quadruplicated plats. A summation of 5 years' work showed the highest average yield and the highest average percentage of No. 1 bulbs on the plants receiving the most frequent irrigation and the greatest amount of water. At the same time the treatment with the smallest number of irrigations and the smallest amount of water returned the lowest yields and the lowest percentage of No. 1 bulbs. It was not possible to associate premature seedstalk formation with any irrigation treatment, but there was some evidence that time of maturity is related to the water supply. The onions on the most abundantly irrigated plats tended to mature last and those on the least irrigated plats first.

Soil-moisture determinations showed the greatest use of water in late May and early June. A tight layer of clay about 5 or 6 ft. below the surface interfered with the downward movement of water and resulted in some difficulty in establishing definite water tables.

Storage studies with onions from the different treatments gave indication that the most frequently irrigated bulbs kept somewhat better and suffered less weight loss in storage. In 1934, a season favorable to the development of thrips and pink root rot, it was impossible to establish the relationship between extent of injury and the differential treatments.

Some factors in tomato fruit setting, including experiments with artificial light, F. S. Howlett (*Ohio Veg. Growers Assoc. Proc., 21 (1936), pp. 79–86*).—Discussing the physiology of flower formation and pollination in tomato, the author reports the successful use of supplemental light in the greenhouses of the Ohio Experiment Station for increasing the number of flowers to attain full bloom and the set of fruit during the dark days of midwinter.

The necessity of minor elements for the growth of tomatoes in a poor soil, J. S. McHargue and R. K. Calfee (*Amer. Fert., 85 (1936), No. 6, p. 24*).—Results of studies at the Kentucky Experiment Station showed very marked benefits from the addition of small quantities of certain so-called minor elements to soil cultures with tomatoes as test plants. The fruit of plants

receiving the minor elements in addition to the usual fertilizers w superior.

Inspection, certification, and transportation of nursery st tucky, with a brief report for the year ended June 30, 1936, W. A. Pric and H. G. Tilson (*Kentucky Sta. Regulat. Ser. Bul. 12 (1937), pp. 11*).—A indicated in the title, this paper contains general information on the carryin out of the Kentucky nursery inspection law.

Hardy fruit growing, F. Keeble and A. N. Rawes (*London: Macmillan & Co., 1936, pp. XI+334 [pls. 21], figs. 3*).—From the English viewpoint, general information is presented on fruit culture, supplemented with sufficient of the principles of growth, reproduction, and nutrition, to give an explanation for the reasons underlying practice.

Pioneering with fruits and berries, G. D. Aiken (*Brattleboro, Vt.: Stephen Daye Press, [1936], pp. XIV+94, pls. [24]*).—General information is presented on the growing of various tree and small fruits and asparagus.

Tree wound dressings, H. C. Young and P. E. Tilford (*Ohio Sta. Bimo. Bul. 186 (1937), pp. 83–87, figs. 2*).—Studies of wounds made on healthy ash, American elm, hickory, oak, Carolina poplar, red maple, and wild cherry trees showed asphalt paint to be a desirable wound dressing, not only in promoting healing but also in decreasing the amount of subsequent decay which appeared to some extent in all treatments. Bordeaux paints plus various amendments added to darken the wound tissues proved unsatisfactory. Although 3.5 yr. elapsed before making final examinations, the authors feel that more time should pass before reaching final judgments on the effects of the treatments.

Variation in the "Paradise" apple rootstocks: A study of some leaf and shoot characters in four races, H. M. Tydeman (*Jour. Pomol. and Hort. Sci., 14 (1936), No. 1, pp. 19–25*).—Detailed studies made at the East Malling Research Station of certain leaf and shoot characters of 1-yr. vegetative shoots arising from vigorous 7-year-old stools of four races, viz, Malling II, a selected clon of Malling II, Malling IX, and a selected clon of Malling IX, failed to show any appreciable difference between the original stocks and the selections therefrom. So far as it was possible to determine, reselection from a single individual plant had neither decreased the variability nor altered markedly the expression of the characters in either of the rootstocks.

The daily rate of photosynthesis, during the growing season of 1935, of a young apple tree of bearing age, A. J. Heinicke and N. F. Childers (*[New York] Cornell Sta. Mem. 201 (1937), pp. 52, figs. 10*).—The enclosure of an entire vigorous young McIntosh apple tree in an assimilation chamber carefully sealed to prevent uncontrolled movement of air and cooled with a refrigeration unit under thermostatic control permitted the study of the carbon dioxide content of the incoming and outgoing air, the difference indicating the photosynthetic activity of the tree. Light intensity was measured with an Eppley pyrheliometer located about 1 mile distant from the experiment but so equipped that automatic records were taken every 3 sec.

The results indicated that there are marked fluctuations in the rate of food manufacture from day to day, with light the most important limiting factor. Leaves well exposed to light and abundantly supplied with water and soil nutrients were evidently capable of carrying on photosynthesis over a wide range of temperatures, as low as just above freezing. The rate of respiration was evidently influenced more by temperature than was the rate of photosynthesis. The higher temperatures which frequently accompanied the highest light intensities increased the rate of respiration and thus tended to offset the influences of favorable light. The closing of the stomata, occur-

ing normally in the afternoon, did not greatly reduce the rate of apparent photosynthesis of the entire tree.

In conclusion the authors suggest that although daily fluctuations of apparent photosynthesis must exert an effect on the chemical balances of the tissues of the trees, there is a question of just how rapidly growth and other metabolic processes adjust themselves to the internal chemical environment. It is believed that in most cases the adjustment is so gradual that the responses are determined to a greater extent by photosynthetic activity over periods of a week or so than by daily fluctuations.

The effect of sodium nitrate and water applications to apple trees suffering from drouth on some chemical constituents of the fruit, H. H. Plagge (*Iowa Acad. Sci. Proc., 42 (1935), pp. 77–79*).—In the dry summer of 1931, Golden Delicious apple trees growing in the orchards of the Iowa Experiment Station were given, beginning August 12, five weekly irrigations each equivalent to a 2.8 acre-in. application of water. In addition, one irrigated and one nonirrigated tree were sprayed with 8 lb. of nitrate of soda. Studies of the fruits showed that irrigating did not materially change the nitrogen content or make the fruit more susceptible to soggy break-down. Sucrose and total sugar content were increased by irrigation. Little difference was recorded between the fruits of the irrigated trees and of the trees irrigated and also receiving nitrogen, either in sugars or nitrogen, but the nitrated nonirrigated fruits were very high in nitrogen, particularly of the noncolloidal type. However, susceptibility to soggy break-down was not increased in this case.

Influence of orchard soil management on tree growth, C. W. Ellenwood (*Ohio Sta. Bimo. Bul. 185 (1937), pp. 56–58*).—Summarizing 22 years' records of the growth of Stayman Winesap and Delicious apple trees grown under two systems of culture, mulched bluegrass and cover crop tillage, there were indicated very slight differences between the two. During the period the total yield of Stayman Winesap was a little greater on the cover crop plat, while the opposite was true for Delicious. The fruits of Stayman Winesap were significantly larger and those of Delicious were somewhat larger on the grass mulch plats. It is suggested that the higher moisture content of the soil in the mulch plats in years of less than normal rainfall is likely responsible for the greater tree growth and the larger total yields. Color of fruit was not materially affected by culture.

Progress report on the investigation of corky core in apples, L. C. Young and C. F. Bailey (*Sci. Agr., 17 (1936), No. 3, pp. 115–127, figs. 2; Fr. abs., p. 127*).—Attempts by the Dominion Experimental Station, Fredericton, New Brunswick, to control corky core by treating trees in different ways with boron, zinc, and magnesium were successful only in the case of boron. Since the amount of corky core varied greatly from year to year even to the point that a tree might be severely affected one year and free the next, continued observations are necessary. The repeated borings of trees which are necessary in the injection treatment are injurious, and the application of boron as a spray is suggested as a promising substitute method. Soil applications were also under study. Anatomical examinations of roots failed to show any correlation between the plugging of the vascular ray cells and the occurrence of corky core. There was, however, a tendency for a concentration of the larger roots at greater depths in nonaffected orchards where corky core was prevalent.

Comparative costs and efficiency of stationary vs. portable spraying, C. L. Burkholder (*Indiana Sta. Bul. 415 (1936), pp. 20, figs. 10*).—A stationary spray plant covering 45 acres, installed in 1930 in the Purdue orchard at Bed-

ford, and portable equipment used in the same orchard were accurately compared as to costs. The data indicated that the entire cost of the stationary plant could be paid in 5 yr. by the savings in the cost of applying the sprays In addition, the permanent equipment was in good condition at the close of 5 yr., whereas the portable outfits were practically worn out. With special equipment, such as long-distance guns, stationary equipment gave satisfactory control of codling moths in the tops of trees. Before securing this additional equipment, the station found that the portable outfits were more effective in the tops of the trees. The control of apple scab was equally good with both types of spraying. The details in the planning, construction, and operation of the stationary plant are presented.

Spray residue work in Missouri, C. G. VINSON (*Missouri Sta. Bul. 382 (1937), pp. 15*).—Experiments conducted with apples sprayed with different schedules and different materials showed that the type of material used has an important influence on the success of washing. Certain oils and proprietary materials, for example, greatly increased the difficulty of removing spray residues, and, on the other hand, the inclusion of lime in the spray facilitated the removal of both lead and arsenicals. Water alone in the wash section of an underbrush flood-type machine reduced the lead content of the spray residue by as much as 50 percent when the original load did not exceed 0.05 grain of lead per pound of fruit. Where oil had been used with each cover spray, 1.2 percent hydrochloric acid plus 4 lb. of dry Vatsol to 100 gal. did not reduce the lead content from 0.1 to within the tolerance limits, the temperature being 65° F. and the exposure 30 sec. Heating the bath to from 100° to 110° made the residue reduction possible. The need of thorough rinsing of fruit with fresh water was indicated. It was possible to reduce the arsenic to a satisfactory extent and yet leave an appreciable residue of lead. Zinc was definitely an interfering substance in the determination of lead by the diphenylthiocarbazone method.

Cold storage problems with apples, M. B. DAVIS and D. S. BLAIR (*Sci. Agr., 17 (1936), No. 3, pp. 105–114; fig. 1; Fr. abs., p. 114*).—Stating that maturity plays an important role in the keeping behavior of apples, the authors report that with Fameuse and McIntosh apples the ground-color and iodine-starch tests have proved the most valuable indexes to maturity. Loss from storage rots was largely eliminated by careful handling and the maintenance of correct temperatures. There was some indication that fruits grown under high nitrogen conditions are more subject to decay than those from low nitrogen areas. Shrinkage loss in storage was largely obviated by a combination of low temperature and high relative humidity. As to apple scald, maturity at time of storing appeared, in the case of McIntosh and Fameuse, to be more important than any other factor. With reference to gas storage, McIntosh apples stored at 40° F. under 7.5 percent carbon dioxide concentration when wrapped in oiled paper kept with less shrinkage than comparable fruits held at 32° in natural atmospheres.

Influence of packing and handling methods on condition of apples barreled for export, P. L. HARDING, J. M. LUTZ, and D. H. ROSE (*U. S. Dept. Agr. Tech. Bul. 559 (1937), pp. 26, figs. 7*).—Stating that barreled apples from the United States often reach European markets in unsatisfactory condition, the authors discuss the results of investigations of various methods of packing apples to minimize losses from injury. One shipment of York Imperials originating in Hancock, Md., was followed through to the English destination. It was established that shaking the barrel 2 or 3 times while filling, racking 15 times when nearly full with the plug, or follower, in place, and filling to about three-fourths of an inch above the top of the staves was sufficient to prevent appre-

ciable settling during transit. Filling the barrel more than three-fourths of an inch above the top of the staves caused an undue amount of bruising and skin breaks, especially when the barrels had been shaken and racked as recommended. Overfilling could not be substituted for adequate shaking and racking in the prevention of slackness. Four varieties, namely, York Imperial, Rome Beauty, Jonathan, and Grimes Golden, were utilized in the experiments, and specific information is presented for each. The higher percentages of bruising noted on Grimes Golden are thought to be due to the fact that the light golden skin failed to mask bruises. From 12 to 14 percent of the skin breaks in barreled apples were found to be due to stem punctures, but no correlation was apparent between the number of stem punctures and the amount of shaking or racking or the height of the pack.

Protection of apples and pears in transit from the Pacific Northwest during the winter months, E. D. Mallison, E. A. Gorman, Jr., and W. V. Hukill (*U. S. Dept. Agr. Tech. Bul. 550 (1937), pp. 55, figs. 19*).—Experiments carried on over a period of several years and mostly during the winter months of December, January, and February showed the need for improved methods of protecting fruit and, to some extent, how to accomplish them. The use of wind-activated fans to increase air circulation served to create more nearly uniform temperature conditions in the cars. In order to prevent dangerously low temperatures near the floor, it was found that heaters should be placed in each bunker. The operation of two heaters according to the temperature needs not only prevented freezing injury but avoided excessively high temperatures in the top layers. The opening of ventilators during periods of high outside temperature was found unnecessary with apples and pears loaded at from 30° to 35° F. With outside temperatures of 20° or lower, prewarming of cars and the retention of heat during loading was found desirable to prevent freezing. Ice in the bunkers not only did not prevent freezing but caused the fruits to freeze more quickly. Insulating materials placed around the fruit actually increased the hazard due to interference with air circulation. Wet sawdust placed under the floor racks and on the bunker floors proved helpful by virtue of the latent heat of fusion when outside temperatures were not below 0° for prolonged periods. Heaters which depended on the natural circulation of air alone did not give uniform and optimum storage temperatures. It was observed that the efficiency of heater service depending on charcoal heaters may be greatly improved by inside control, that is, by releasing the heat inside the cars when the minimum temperature in the car drops to slightly above the freezing point of the fruit.

Stem-end shrivel of Packham's Triumph pear, H. Broadfoot and E. C. Whittaker (*Agr. Gaz. N. S. Wales, 47 (1936), No. 11, pp. 635, 636, fig. 1*).—This condition was found to be influenced mainly by the developmental stage of the fruit when picked. The best stage for harvesting was when the fruit showed a decided yellowish tinge and a pressure test reading of about 12 lb.

Pollination studies with plums, II [trans. title], C. F. Rudloff and H. Schanderl (*Gartenbauwissenschaft, 10 (1937), No. 5–6, pp. 669–687*).—Of 65 varieties under observation in this continued study (E. S. R., 70, p. 626), 39 were definitely self-unfruitful, 4 partially unfruitful, and 22 clearly self-fruitful. Compatible pollinizers are suggested for the various varieties with no evidence that cross-pollination increased the yield of self-fruitful plums. In the case of varieties with poorly germinating pollen, percentage of germination was increased by adding stigmatic tissues to the culture. Supplemental stigmatic tissue of the same variety was more effective with pollens of the self-fruitful than of the self-unfruitful kinds.

Nitrogen and carbohydrate content of the strawberry plant: Seasonal changes and the effects of fertilizers, J. H. Long and A. E. Murneek (*Missouri Sta. Res. Bul. 252 (1937), pp. 52, figs. 27*).—Aroma strawberry plants, selected as the first runners to develop from mother plants set out in early April in fertile propagating soils, were sampled at different periods throughout the growth cycle. The dry weight of the plants was found to increase rapidly during autumn and reach a maximum at the approximate stage of greatest leaf development. A decrease began with the dormant season and continued on through flowering, fruiting, and runner formation. Total nitrogen reached the maximum in November and from then on decreased slowly through the dormant season and rather rapidly through the fruiting and runner-production periods. At the time of the greatest development of leaves in late autumn, 70 percent of the nitrogen was in the leaves, but in winter from 30 to 40 percent could be found in the roots. Young, developing leaves and reproductive organs drew heavily on the stored nitrogen, so that roots and stems were almost completely free by midsummer. There was noted a rapid flow toward the stems and roots of soluble carbohydrates during summer and autumn, and particularly during the period of leaf senescence. As a result, sugars attained a high concentration in the stems and roots during the dormant season. At the time of maximum foliar development, from 50 to 75 percent of the total sugar was in the leaves. Accumulation of sugar was accompanied by a decrease of starch and hemicellulose. Two seasonal maxima, February and November, and three minima, April, October, and January, were noted in starch accumulation.

Applications of nitrogen fertilizer, either organic or inorganic, did not alter greatly the seasonal variation in carbohydrate contents. Nitrogen fertilizer in all forms did increase the number of flowers. Spring application increased the leaf area and nitrogen concentration in all parts of the plant but had no material effect on fruit production. Only in the absence of adequate fall supply of nitrogen did spring applications influence fruit development, thus indicating the practical desirability of applying nitrogen in autumn. A minimum quantity of 0.12 g of nitrogen per plant in October is believed necessary to the production of a maximum number of flowers in the Aroma variety. Leaf measurements indicated that a minimum leaf area of 300 cm^2 during the period of flower-bud formation is essential for each Aroma budding plant.

Strawberry fertilizer studies in Maryland, W. E. Whitehouse and A. L. Schrader (*Maryland Sta. Bul. 403 (1936), pp. 177–206, figs. 2*).—Studies conducted with four varieties of strawberries grown on soils varying in character from loamy sands to heavy silt or clay loams indicated that the fertilizer treatment, both as to time of application and quantity and quality of materials, must be varied with the variety and with the type of soil. Before the strawberry plants were set, the average soil required a fertilizer containing quickly available nitrogen in order to develop adequate runner plants. Fertile soils, on the other hand, were often sufficiently provided with plant food to grow excellent stands without fertilizer. Certain varieties, such as Missionary, which produce runners freely, may be easily stimulated to an overproduction of young plants. With respect to yield, the response to fertilizers applied prior to planting was such as to suggest that on good quality soils it may be difficult to show significant increases from fertilizer use.

Late summer applications of fertilizer, on the contrary, usually gave good results, probably because of the increased growth and development of the plants which in turn enabled them to produce larger berries and mature them earlier. Late summer applications were more desirable and beneficial than applications in the spring of the first fruiting year. Top dressings in the

spring of the second season may, however, be expected to increase yields. There was apparently a close relationship between soil moisture and other environmental factors and the effects of fertilizer applied in the spring of the fruiting year. The evidence from the use of lime was such as to indicate that applications sufficient to satisfy the lime requirement of the soil had a detrimental effect on early runner formation. In very acid soils moderate applications of lime were beneficial.

Strawberries under neon light, J. W. M. Roodenburg (*Jour. Roy. Hort. Soc., 61 (1936), No. 12, pp. 504–509, pls. 4, fig. 1*).—Provided that irradiation of strawberry plants of the Deutsch Evern variety was begun in early October before naturally short days and low temperatures had induced a condition of rest, it was possible to continue the plants in a vegetative condition with abundant flower formation and early fruit. Otherwise, it was necessary to submit the plants to low temperature and begin forcing about New Year's Day.

Hybridization of the strawberry [trans. title], N. J. Fedorowa (*Gartenbauwissenschaft, 10 (1937), No. 5–6, Ref., pp. 106, 107*).—The genus *Fragaria* is said to occupy a singular position in the plant kingdom because of its very high degree of polyploidy, exhibiting forms with as many as 98 somatic chromosomes, all based on an original haploid number of seven. Polyploidy is very frequent, and segregation into staminate-, pistillate-, and perfect-flowered forms occurs to an unusual degree. The perfect plants transmit no special sex tendency to their progeny, whereas the pistillate plants appear to consist of at least two genetic types, one of which yields staminate and pistillate progeny and the other pistillate and perfect- flowered progeny. Pistillate plants which in crossing with perfect or staminate plants yield perfect progeny must possess some weak male sex-determining factors.

Red fruit color was found dominant over white and was determined by a dominant gene. Everblooming was a recessive character controlled by a single recessive gene. A limited number of flower stalks was dominant over a larger number and was apparently determined by several dominant genes.

Four species, *F. vesca*, *F. grandiflora*, *F. elatior*, and *F. virginiana*, entered into the study.

Sanding cranberry bogs, C. S. Beckwith (*New Jersey Stas. Circ. 371 (1937), pp. 4*).—General information is given on the present status of sanding cranberry bogs, on methods of applying sand, and on the potential benefits.

Results of manurial experiments on cacao at Marper, F. J. Pound and J. de Verteuil (*Trop. Agr. [Trinidad], 13 (1936), No. 9, pp. 233–241*).—Of various fertilizing materials, potassium sulfate applied at the rate of 300 lb. per acre proved most profitable. Superphosphate of lime yielded a reasonable profit, but the combination of potassium and phosphorus, although increasing yields, did not give profitable returns. Lime applied at the rate of 5 tons per acre increased yields by nearly 40 percent but was not profitable. Nitrogen gave no benefit at all and when used with either phosphorus or potassium tended to decrease rather than increase yields.

The cryoscopic determination of the osmotic value of citrus leaf sap, F. F. Halma (*Gartenbauwissenschaft, 10 (1937), No. 5–6, pp. 659–668, figs. 2*).—From this study, conducted by the California Experiment Station, on different methods of killing tissues, expressing sap, and recording the freezing point depression thereof, the author suggests (1) the killing of leaves in boiling water for 30 min., a procedure which rendered the tissues more stable under storage conditions than freezing with solid carbon dioxide and was more convenient and less expensive; (2) expressing the sap with a powerful vise which requires less time than with a hydraulic press; and (3) the use of a micro-

cryoscope which required only 2 cc of sap for an accurate reading. With all three species used, namely, lemon, orange, and grapefruit, the amount of sap obtained from the frozen material was generally greater than that secured from heated tissues.

Growth and water losses in citrus as affected by soil temperature, A. R. C. Haas (*Calif. Citrogr., 21 (1936), No. 12, pp. 467, 479, fig. 1*).—Observations by the California Experiment Station, Riverside, on rooted leafy twig cuttings of Valencia oranges placed in soil tanks maintained at 19°, 23°, 27°, 31°, and 35° C. showed the temperature range of from 23° to 31° C. (73.4° and 87.8° F.) most favorable for growth. In transpiration studies with rooted cuttings of lemon and grapefruit the water losses per unit of leaf area in the lemon increased with increasing soil temperature up to 31° C. In the case of grapefruit, the maximum was reached at 27°.

Report on duty of water investigations on citrus cultivation at Gan Moshe, near Rishon le Tsiyon, during the years 1931–32–33, J. Dawson Shepherd, M. J. Goldschmidt, and J. D. Oppenheim (*Jerusalem: Palestine Dept. Devlpmt., [1936], pp. [5]+28, [figs. 10]*).—Evidence is presented in favor of moderate applications of irrigation water, with indications that unnecessarily large amounts of water have been used in the citrus-growing industry in Palestine. Among advantages of moderate irrigations were a wider spreading root system, better aeration of the soil, and an actual saving in the cost of production.

Use of soil-moisture and fruit-growth records for checking irrigation practices in citrus orchards, C. A. Taylor and J. R. Furr (*U. S. Dept. Agr. Circ. 426 (1937), pp. 24, figs. 14*).—Designed to serve as a guide to citrus growers who need a more accurate control of soil moisture, this paper presents information on soil-moisture control; amount of moisture readily available to trees, typical orchard records, the use of fruit-growth and soil-moisture records, and procedure and equipment. It is pointed out that soil samples taken in the zones of soil most thoroughly permeated by feeder roots give the first indication of moisture exhaustion. Details are presented on the method of checking soil moisture in each furrow or border to determine penetration while the water is actually flowing. Fruit measurements before and after irrigation were found to indicate any unusual need of water in the tree and enable the grower to determine the satisfactory interval between irrigations.

Notes on colorimetric tests for citrus species, R. H. Marloth (*Jour. Pomol. and Hort. Sci., 14 (1936), No. 1, pp. 1–8*).—Presenting the results secured with four reagents, viz, Almen, ammonium molybdate, titanous chloride, and ferric chloride used with aqueous extracts of ground dried bark, dried roots, and dried leaves of several different forms of citrus, the author reports that samples belonging to one species such as the sweet orange often showed great variation, chiefly in color or shade, with certain reagents. Color reactions of hybrids showed no correlation with the reaction obtained with their parents. The conclusion is reached that not until the actual source and cause of color reactions is determined will these identification methods become absolutely reliable.

Is whitewashing to prevent sunburn on frozen citrus trees a safe practice? H. J. Webber (*Calif. Citrogr., 22 (1937), No. 5, pp. 185, 214, fig. 1*).—In discussing past observations following freezes, the author points out that the evidence available on the effects of whitewashing frozen citrus trees is too incomplete and conflicting to permit the deduction of conclusions and the formulation of definite recommendations. There was evidence in some cases that whitewashing may be more harmful than beneficial.

The relative penetrability of various tissues of the orange and the banana to ethylene, D. A. HERBERT and L. J. LYNCH (*Roy. Soc. Queensland Proc., 46 (1934), pp. 72–79, pl. 1*).—The diffusion of ethylene through the epicarp, mesocarp, and endocarp of orange and banana fruits was studied, using *Stellaria media* as a test plant. It is concluded that the differences in ripening of these fruits in an atmosphere containing ethylene are not due to a barrier against diffusion into the orange pulp, since the mesocarp of the banana offered approximately the same resistance as that of the orange.

Storage temperatures for shortening the rest period of gladiolus corms, F. E. DENNY (*Contrib. Boyce Thompson Inst., 8 (1936), No. 2, pp. 137–140*).—Using Nos. 1 and 2 sized corms of several varieties, the author found that with lots stored at room temperature for 10 days after harvest 3° and 10° C. were much more effective in causing early germination than were higher temperatures. Except for the varieties Mrs. F. C. Peters and Mrs. Frank Pendleton, which required 6 weeks, a period of 3 weeks at these lower temperatures hastened germination. When the corms were allowed to stand until 52 days after harvest, the effects of storage temperature were different. Low temperature caused earlier germination in certain varieties, high temperature in others, and in two varieties, Mr. W. H. Phipps and Giant Nymph, 6 weeks' storage produced similar results both at 3° and 35°.

Longevity of pollen of Lilium and hybrid Amaryllis, N. E. PFEIFFER (*Contrib. Boyce Thompson Inst., 8 (1936), No. 2, pp. 141–150*).—As a result of investigations with four species of *Lilium* and one hybrid *Amaryllis*, the author suggests two methods of conserving viability—(1) storage in relative humidities of 35, 50, and 65 percent at 10° C. and (2) storage in gelatin capsules without humidity control at −5° for *Lilium* and −11° for *Amaryllis*. With regard to relative humidity, the various species of lilies appeared to have rather specific optima, 35 percent for *L. auratum*, 50 percent for *L. speciosum*, and 65 percent for *L. longiflorum*.

Results of studies with poinsettias grown in sand, R. B. FARNHAM (*Florists' Rev., 78 (1936), No. 2007, pp. 19, 20, fig. 1*).—At the New Jersey Experiment Stations, poinsettia plants started from cuttings on June 6 and later transferred to 4-in. pots were grown in a series of sand cultures involving a complete nutrient solution used at approximately ½-, 1-, and 2-atmosphere concentrations. The plants receiving the low concentration solution produced a large succulent growth, and when transferred at Christmas time to room conditions lost nearly all their leaves within 2 weeks. The smallest plants, 2-atm. concentration, held all their leaves for more than 4 weeks. During the test period, no additional nutrients were supplied. In conclusion, the author suggests that to produce poinsettias of good keeping quality the plants should be held on the dry side by infrequent small applications of water.

Pyrethrum (Pyrethrum cinerariaefolium Trev.), P. TOPALOV (TOPALOFF) (*Pyretrum (Pyrethrum cinerariaefolium Trev.). Sofiya (Sofia): Govt., 1936, pp. 48, figs. 7; Eng. abs. pp. 45–47*).—In this discussion of the pyrethrum-growing industry in Bulgaria, the author states that with respect to pyrethrin content Bulgarian pyrethrum has a very high rating. Some evidence was secured that pyrethrin-producing capacity is a heritable factor, although influenced by climatic and other unknown conditions prevailing during any given growing season. The commercial culture of pyrethrum is considered practicable only when the pyrethrin content is at least 1 percent.

The wild garden, M. MCKENNY (*Garden City, N. Y.: Doubleday, Doran & Co., 1936, pp. 123, [pl. 1, figs. 10]*).—General information is presented on plant materials and culture.

FORESTRY

Forests of South Dakota: Their economic importance and possibilities, E. R. Ware (*U. S. Dept. Agr., Forest Serv., 1936, pp. 28, figs. 6*).—A survey of the State showed approximately 3.5 percent of the total area to be occupied by forests and that conifers were of first importance from the standpoint of area and of volume and quality of the timber. In a survey of plantations it was observed that two peaks of planting had occurred, one about 1885 and the other about 1900. Among factors favoring planted trees were high annual rainfall, moderate depth of the water table, and a lack of grazing. Data are presented on the annual cut in South Dakota forests, and a program for the management of the forests is suggested.

Reduction in the number of trees in maturing pine forest, L. M. Turner (*Ill. State Acad. Sci. Trans., 29 (1936), No. 2, pp. 77, 78*).—Records taken by the Arkansas Experiment Station of trees in 23 stands of shortleaf pine, varying in age but all located on Hanceville sandy loam with a slope of approximately 20 percent and an estimated site index of 50, showed that the greatest mortality occurs in the early years of the stand. In the 7 yr. between the ninth and the sixteenth year of growth, there was a loss of 54 percent of the trees. From there on the annual losses steadily decreased; however, the number of trees in the 152-year-old forest was estimated as only 0.42 percent of the number in the 9-year-old stand.

Construction of yield tables for nonnormal loblolly pine stands, A. L. MacKinney, F. X. Schumacher, and L. E. Chaiken (*Jour. Agr. Res. [U. S.], 54 (1937), No. 7, pp. 531–545, figs. 7*).—Using as a background data taken on 150 mechanically selected temporary plats established during the course of a study of the loblolly pine pulpwood resources of the Coastal Plain and eastern Piedmont sections of Virginia, North Carolina, and South Carolina, a method is suggested for preparing a yield table for even-aged, second-growth loblolly pine either pure or mixed with other species. The method involves the fitting of a growth curve to mechanically selected data, and its advantages are indicated as follows: (1) A reduction in the amount of data required to construct similar tables by the graphic method, (2) a minimization of errors due to personal bias in freehand curve fitting, and (3) the computations provide statistical measures of the fit of the curve as well as measures of the errors to be expected when the estimating mechanism is applied to other data. Disadvantages are listed as follows: (1) There is involved a rather laborious procedure as well as a knowledge of correlation analysis, (2) the approximation method of determining maximum yields is not based on unimpeachable assumptions, and (3) predictions of growth and future yields are adequate only when information on the changes in density and perhaps in site and composition are also available.

Yield, stand, and volume tables for even-aged upland oak forests, G. L. Schnur (*U. S. Dept. Agr., Tech. Bul. 560 (1937), pp. 88, figs. 22*).—Stating that the upland oak region comprises approximately one-fifth of the commercial forest area of the United States and that the destruction of the chestnut has altered the growth capacity of certain stands and hence the usefulness of some of the earlier tables, the author presents tables based on measurements obtained on sample plats and on trees cut in logging operations throughout the region. Although 15 species of oak and 50 of associated trees occurred in innumerable combinations, 5 oaks—white, black, scarlet, chestnut, and red—made up 83 percent of the stand basal area. The maximum mean annual growth of the merchantable stems on an average site was found to be 47 cu. ft., or about 0.55 cord per acre. Culmination of growth for the merchantable stand occurred at

about 55 yr. on the best site and at 90 yr. on the poorest. The growth rate was within 5 percent of the maximum for approximately 50 yr. on the average site, the best site arriving at this point at about 45 yr. and the poorest at about 70 yr. White oaks were found to decrease and black oaks increase in number with increasing site quality.

Yield of even-aged stands of Sitka spruce and western hemlock, W. H. Meyer (*U. S. Dept. Agr., Tech. Bul. 544 (1937), pp. 86, pls. 5, figs. 21*).—Asserting that in general the hemlock-spruce type is associated with a climate characterized by high precipitation, frequent fogs, moderate temperature, and the absence of extreme winter cold, the author discusses the silvical characteristics of the Sitka spruce and western hemlock and presents data in the form of yield, stand, and volume tables, and information on growth and yield for different aged groups on various quality sites. The better the quality of the site, the faster the diameter, height, and volume growth of single trees and of entire stands. Sitka spruce was found usually to produce larger and taller trees than western hemlock, and as a result stands having greater percentages of spruce had greater basal areas, greater average diameters, and greater cubic-foot and Scribner board-foot volumes. On comparable quality sites, the spruce-hemlock type considerably outyields the Douglas fir type.

Ohio Forests News, [May 1937] (*Ohio Forest News [Ohio Sta.], No. 31 (1937), pp. 8, fig. 1*).—In the usual manner (E. S. R., 77, p. 50), there are presented items of general information regarding forest planting and forest management and notes concerning the activities of the Federal forest agencies, such as the Central States Forest Experiment Station.

Fire Control Notes, April 12, 1937 (*U. S. Dept. Agr., Forest Serv., Fire Control Notes, [No. 4], (1937), pp. 168–227, figs. 18*).—General information is included on the use of airplanes as conveyors of supplies, on radiophone equipment, held line production, power-driven saws, emergency landing flares, etc.

DISEASES OF PLANTS

Crop losses from plant diseases in the United States in 1936, compiled by H. A. Edson and J. I. Wood (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1937, Sup. 100, pp. 47–49*).—"These estimates have been computed and are presented in the same manner as in previous years" (E. S. R., 76, p. 339), including data for the same crops. Some of the outstanding variations between the 1935 and 1936 estimates are listed.

The Plant Disease Reporter, June 1 and 15, 1937 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 21 (1937), Nos. 10, pp. 179–189, figs. 2; 11, pp. 191–219, fig. 1*).—The following items of current interest are included:

No. 10.—Unreported powdery mildews (31 California hosts of species of *Erysiphe* and *Podosphaera* apparently not previously recorded for the United States), by C. E. Yarwood; downy mildew and bacterial leaf spots of tobacco in Kentucky (current season reports), by E. M. Johnson; downy mildew development on tobacco in North Carolina and Virginia, April 20 to May 15, by P. R. Miller; fruit disease situation in Illinois, by K. J. Kadow; fruit diseases in Missouri, by M. A. Smith; plant diseases in Kentucky in 1937, by W. D. Valleau; plant diseases reported from Arkansas, by V. H. Young; and notes on diseases of ornamentals in Oregon, by F. P. McWhorter.

No. 11.—Present conditions favor outbreak of stem rust in the Plains region, by H. B. Humphrey et al.; rusts on cereals in Virginia (to June 5), by G. E. Matheny; loose smut (*Ustilago tritici*) of wheat serious in Kansas, Oklahoma, and Texas, by C. O. Johnston; unusual amount of wheat bunt (*Tilletia* spp.) in

Texas, by I. M. Atkins; crown rust and smut-resistant oat varieties, by H. C. Murphy; reaction of certain varieties of wheat to infections of powdery mildew at Manhattan, Kans., 1932–35 (contribution by the Kansas Experiment Station in cooperation with the Bureau of Plant Industry, including data for varieties of hard red winter, soft red winter, white winter, hard red spring, soft red spring, white spring, durum, and Poulard wheats, and for *Triticum dicoccum*, *T. monococcum*, and miscellaneous *Triticum* species), by C. O. Johnston, H. Fellows, and L. E. Melchers; bacterial wilt of sweet corn on Long Island, by M. C. Richards; preliminary report of cotton diseases in Virginia, by P. R. Miller and J. Godkin; fruit diseases reported from New York, by various observers; fruit disease situation in Illinois, by K. J. Kadow; fruit diseases reported from Idaho, by E. Blodgett; vegetable diseases in Nassau County, Long Island, by M. C. Richards; downy mildew (*Peronospora destructor*) of onion in New York, by A. G. Newhall; some unusual diseases of ornamentals in Virginia, including *Cladosporium* leaf and stem disease of snapdragons, a *Phoma* leaf spot and stem canker of *Antirrhinum* spp., and infection of *Buxus sempervirens* by *Verticillium* spp., by J. G. Harrar; diseases of Virginia ornamental trees, by J. G. Harrar and S. A. Wingard; and tobacco downy mildew (*Peronospora tabacina*) in Connecticut, by P. J. Anderson.

[Plant disease work by the New Jersey Stations] (*New Jersey Stas. Rpt. 1936, pp. 36, 37, 69, 70–78*).—Progress reports are included on cranberry false blossom control; potato work (including spray tests and fertilizer-mercury trials for control of *Rhizoctonia* and scab); diseases of vegetables (including sweetpotato diseases, cabbage clubroot, sweet corn wilt and smut, tomato diseases, cantaloup spray for bacterial wilt, rhubarb root treatment, celery blight, eggplant fruit rot and wilt, cucumber nematodes, and pea root rot); spray injury and control of apple scab; control of blackberry double blossom; and diseases of ornamentals (including rhododendron wilt, sulfur residue investigations, gladiolus scab control, red pine root rot investigations, chestnut oak blight, nematode control on gardenia, maple wilt control, *Typhula graminis* on turf, delphinium crown rot, *Septoria* sp. on chrysanthemums, and blueberry disease control).

[Plant disease work by the Wisconsin Station] (*Wisconsin Sta. Bul. 438 (1937), pp. 88, 103–120, figs. 8*).—Reports of progress are included on the amount of sulfuric acid needed for control of damping-off fungi by S. A. Wilde and H. M. Galloway; the influence of weather conditions on tobacco mosaic infection, by J. Johnson and I. Hoggan (cooperative with the U. S. Department of Agriculture); tobacco "blackfire" disease, by Johnson and A. C. Braun (cooperative, U. S. D. A.); efforts to find a practical way of controlling potato scab, by J. C. Walker, R. H. Larson, and A. R. Albert; scabbed barley unsatisfactory for hogs even after the fungus is dead (including its use for malting and control of barley diseases), by R. G. Shands (cooperative, U. S. D. A.); lateness and height of corn correlate with resistance to wilt (*Phytomonas stewarti* strains studied), by S. S. Ivanoff, A. J. Riker, and J. G. Dickson; tomato diseases causing severe damage, by Walker, O. C. Whipple, and V. Wright; war waged against cabbage diseases (yellow, mosaic, and clubroot), by Walker (cooperative, U. S. D. A. and the Wisconsin Alumni Research Foundation); three new diseases of peas and beans appearing in Wisconsin (spotted wilt, virus 729, and virus 408), by Walker, Whipple, and W. Virgin; breeding of smut-resistant onions, by Walker (cooperative, U. S. D. A.); copper sprays showing promise for controlling fire blight of apple, by G. W. Keitt and J. B. Carpenter; lime-sulfur compared with substitutes for control of apple

scab, by Keitt, C. N. Clayton, and Carpenter; the problem as to whether there are other copper fungicides better than bordeaux mixture for combating cherry leaf spot, by Keitt and Clayton; and continued studies on crown gall, by J. M. Van Lanen, Riker, I. L. Baldwin, S. B. Locke, B. M. Duggar, H. A. Conner, R. Nagy, and W. H. Peterson.

The nitrogen metabolism of the crown gall and hairy root bacteria, H. A. Conner, W. H. Peterson, and A. J. Riker (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 8, pp. 621–628*).—From this study by the Wisconsin Experiment Station, quantitative data were obtained regarding the nitrogen metabolism of the crown gall (*Phytomonas tumefaciens* [=*Bacterium tumefaciens*]), attenuated crown gall, and hairy root (*P. rhizogenes* [=*B. rhizogenes*]) organisms in different media. In media containing glucose and yeast infusion, about one-fourth to one-third of the total nitrogen was converted into cellular proteins. With the two crown gall forms the amino nitrogen decreased, but with the hairy root organism it did not, indicating that its formation equaled its utilization. With all three organsms, ammonia nitrogen decreased slightly, and in media containing ammonium salts utilization of the ammonia occurred. In similar media minus glucose, large amounts of ammonia were formed. Protein nitrogen increased to about the same degree as with glucose present. In the presence of glucose the two crown gall forms utilized ammonium nitrate as the sole nitrogen source, but ammonia nitrogen proved more available than nitrate nitrogen. The polypeptide and amino nitrogen peptone was readily utilized by the organisms under test, resulting in increases of cellular proteins and ammonia. The fraction precipitated by tungstic acid proved less readily available.

Variation in mass isolates and monoconidium progenies of Ceratostomella ulmi, J. M. Walter (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 7, pp. 509–523, figs. 6*).—The observations and experiments presented indicate that *C. ulmi* comprises a wide range of cultural races. Strikingly different races appeared as sectors in isolates from diseased trees and in monoconidium progenies from such isolates. The significance of these findings to those concerned with the cultural diagnosis of the Dutch elm disease is stressed.

Trichomes of incidental importance as centers for local virus infections, L. W. Boyle and H. H. McKinney (*Science*, *85* (*1937*), *No. 2210, pp. 458, 459*).—The reported studies indicate that although the trichomes do serve as centers for local virus infection, their importance in comparison with other cells of the epidermis seems to have been overestimated.

Hydrogen sulphide injury to plants, S. E. A. McCallan, A. Hartzell, and F. Wilcoxon (*Contrib. Boyce Thompson Inst.*, *8* (*1936*), *No. 3, pp. 189–197, figs. 3*).—Green plants of 29 species were fumigated in glass chambers out-of-doors during the growing season, the compressed H_2S gas being introduced in an air stream blown through the chambers. Young, rapidly elongating tissues were characteristically more sensitive to injury than older tissues. Typical symptoms were scorching of the young leaves and shoots and basal and marginal scorching of the next older leaves, mature leaves being unaffected. Symptoms were usually fully developed within a few days. Carnation, purslane, Boston fern, apple, cherry, peach, strawberry, and coleus showed no appreciable injury below 400 p. p. m.; pepper, rose, nasturtium, castor-bean, gladiolus, sunflower, buckwheat, and cornflower slight to moderate injury at 40–400 p. p. m.; and soybean, Turkish tobacco, aster, kidney bean, cucumber, tobacco (*Nicotiana glauca*), salvia, poppy, tomato, clover, radish, calliopsis, and cosmos slight injury below 40 p. p. m. and severe injury and death above 400 p. p. m. Temperature proved to be as important as H_2S concentration,

injury increasing rapidly with rises therein. In some cases wilted plants appeared less sensitive to injury than normal turgid plants. Aster, buckwheat, sunflower, and tomato, tested for lime-sulfur injury, showed symptoms identical with those induced by H_2S.

The action of fungous spores on bordeaux mixture, S. E. A. McCallan and F. Wilcoxon (*Contrib. Boyce Thompson Inst., 8 (1936), No. 2, pp. 151–165, figs. 6*).—In the mother liquor above freshly prepared 4–4–50 bordeaux mixture about 1 p. p. m. of soluble copper was found, but that going into solution in distilled water in contact with the dried fungicide did not exceed 0.3 p. p. m., which was insufficient to affect materially the germination of most fungus spores. Spores obtained by a vacuum technic, preventing their contamination by the medium, were suspended in water, allowed to stand for several hours, and filtered, the filtrates being placed over dried bordeaux mixture and agitated overnight. Water extracts from 100 million spores brought copper into solution as follows: *Uromyces caryophyllinus* 1.01 mg, *Sclerotinia fructicola* 0.76, *Neurospora sitophila* 0.12, *Botrytis paeoniae* 0.1, *Glomerella cingulata* 0.046, *Aspergillus niger* 0.023, and *Alternaria solani* 0.013 mg. The total solids excreted by the spores indicated that the species excreting the largest amount of solids were also most active in bringing copper into solution from the fungicide.

Comparative toxicity tests of soluble ($CuSO_4$) and insoluble (bordeaux mixture) copper indicated (with the five fungi used) little difference in sensitivity to $CuSO_4$, but considerable difference as to bordeaux mixture. Also, the spores most sensitive to the toxic effect of bordeaux mixture were, in general, the ones most active in bringing copper into solution from the fungicide. The active material in the spore excretions was in true solution, as shown by ultrafiltration tests. Practically all the active material could be removed in the first spore washing, and it was not appreciably renewed except for *N. sitophila*. By collecting 360 billion spores of the latter a quantity of spore excretion was obtained, from the lead precipitation of which 3.1 percent of malic acid was identified as present in the solid matter excreted by the spores. Amino nitrogen determinations of the excreted solids indicated the presence also of amino acids. Spore excretions were practically neutral, and hence could not act because of acidic properties. It is well known that certain amino acids form soluble complexes with copper oxide, and it has also been found that glycine, aspartic acid, and neutral sodium malate can dissolve large amounts of copper from bordeaux mixture. Comparative toxicity tests of sodium cuprimalate and of a copper glycine derivative indicated that these forms of copper exert substantially the same action as $CuSO_4$. It is believed that the salts of hydroxy acids such as malate and perhaps others, as well as of amino acids present in the spore excretions, act on bordeaux mixture to form soluble toxic copper and copper amino salts.

Stability of formaldehyde dust prepared with different absorbents, J. D. Wilson and H. C. Young (*Ohio Sta. Bimo. Bul. 185 (1937), pp. 53–56*).—Ordinary concentrated formaldehyde solution was added to a wide variety of absorbents. The mixtures were stored in tight glass jars in a cool, dark room and analyzed for formaldehyde by the official A. O. A. C. method immediately and at the end of 3 and 7 mo. Decreases of from 20 to over 80 percent in the original formaldehyde content occurred with marl, muck, gypsum, and charcoal. Corresponding decreases with kaolin, infusorial earth, sawdust, and grain hulls varied between 2.5 and 8.4 percent. In another test the latter absorbents held the strength well for 13 mo. Charcoal, muck, marl, or gypsum are not recommended except for immediate use.

Seed treatment experiments with oats naturally and artificially inoculated with smuts, R. W. Leukel (*U. S. Dept. Agr., Tech. Bul. 568 (1937), pp. 16*).—"In experiments with 11 varieties of oats over a 5-yr. period, higher percentages of smut usually resulted from seed inoculated by a spore suspension under vacuum than from seed inoculated similarly without vacuum or with dry spores, or from naturally inoculated seed. The smut infection caused by the evacuation method of inoculation was at times less amenable to control by disinfectants than was that caused in other ways. Oat smuts developed most abundantly in soil with a low to medium moisture content and at a temperature of about 20° C.

"The treatments that controlled oat smuts most satisfactorily were those with New Improved Ceresan, formaldehyde dip or spray, certain formaldehyde dusts, and Formacide, a paraformaldehyde dust containing a catalytic agent, which, in the presence of moisture, causes paraformaldehyde to revert to gaseous formaldehyde. The dusts were more effective if applied two or more days before sowing. All of them injured germination at times when the treated oats were stored too long without proper aeration or when the seed had a relatively high moisture content. Prolonged storage of oats treated with the above dust fungicides is not recommended unless the grain has a moisture content of about 14 percent or less, is thoroughly aerated a few days after treatment, and the storage place is cool and dry."

Rice disease investigations, T. C. Ryker (*Louisiana Sta., Rice Sta. Bien. Rpt. 1935–36, pp. 13, 14*).—Following a summary of rice diseases in 1936, brief reports are given of studies of root rot due to *Pythium* sp.; whitetip (probably of physiological origin), cooperative with M. B. Sturgis; and *Rhizoctonia* sheath spot.

Influence of soil temperature and soil moisture on infection of stem smut of rye, L. Ling and M. B. Moore (*Phytopathology, 27 (1937), No. 5, pp. 633–636*).—Repeated experiments were carried out (1932 and 1934) by the Minnesota Experiment Station, using constant temperature tanks in the greenhouse, to determine the effects of soil temperature and moisture on infection of rye by *Urocystis occulta*. Infection occurred commonly at soil temperatures of 5°–25° C., with decidedly less toward the extremes. The optimum temperature range for infection was 13°–17°, and possibly the lower optima were correlated with shallow planting, the lower temperature prolonging the susceptible stage of the seedlings. High soil moisture (65 percent of the water-holding capacity) reduced the amount of infection and also may have narrowed its temperature range.

Physiologic forms of loose smut of wheat, W. F. Hanna (*Canad. Jour. Res., 15 (1937), No. 4, Sect. C, pp. 141–153*).—"Four physiologic forms of loose smut of wheat have been found in Manitoba. Two of these forms were collected in the field, one on Reward and the other on Mindum. The two other forms appeared in the course of artificial inoculations in the greenhouse. The origin of physiologic forms of loose smut of wheat is discussed. It is considered that one of the forms that appeared in the course of the greenhouse inoculations may have resulted from a mutation. Evidence is put forward which indicates that different physiologic forms occur in eastern and western Canada. None of the 13 varieties of wheat used in the inoculation experiments proved to be resistant to all physiologic forms. The inoculation of Reward, Marquis, Garnet, and Pentad × Marquis with their own spores for four generations did not result in appreciably increasing the infections on these varieties. It was also shown that the healthy Reward plants that are sometimes present in a population grown from artificially inoculated seed are not resistant to loose smut, but have escaped infection because of faulty inoculation."

The role of certain fungi in the "sick wheat" problem, R. C. Thomas (*Ohio Sta. Bimo. Bul. 185 (1937), pp. 43–45*).—This study showed a great difference in the toxic effect of the byproducts of growth of various fungi, including molds, upon the viability of wheat. All of the organisms tested are commonly associated with grains both in the field and in storage, but are important only when the moisture content of the grain is high and the temperature favorable for mold growth. *Aspergillus flavus* and *A. niger* were found to elaborate toxic products when grown upon bran, as demonstrated by the reduction of viability of normal wheat soaked in the filtrates. What further changes these molds may cause in bringing about the condition known as sick wheat, rendering the grain inferior and milled products below standard, remains to be determined.

Relation of sulphur dioxide in the atmosphere to photosynthesis and respiration of alfalfa, M. D. Thomas and G. R. Hill (*Plant Physiol., 12 (1937), No. 2, pp. 309–383, figs. 12*).—Extensive foliar destruction of alfalfa by SO_2 fumigation was followed by rather rapid growth of new leaves and corresponding reestablishment of photosynthetic activity. Short fumigations with high concentrations of CO_2 discontinued before producing appreciable leaf destruction, caused large reductions in the photosynthetic rate during fumigation, but photosynthesis began to increase within 1 hr. after treatment. The effect was noted in a somewhat lowered assimilatory rate for about 2 days thereafter, whereupon the rate became normal or greater than normal. A number of short fumigations at concentrations of 0.7–1.26 p. p. m. each caused definite decreases in the photosynthetic level, but immediately thereafter the activity rose to normal or greater than normal, so that the net effect of the fumigations was practically zero. Other similar tests with successive applications of low concentrations gave comparable results, or at most a very slight net reduction in total assimilation. Three long continuous fumigations (1935) showed no effect of fumigation or even a slight stimulation of apparent assimilation, with 0.24 p. p. m. for about 3 days, with 0.19 p. p. m. for 11 days, and with 0.14 p. p. m. for at least 39 days. Continued application of the higher concentrations caused a gradual reduction in the photosynthetic level, with attendant visible leaf markings and premature shedding of the older leaves. There was a definite tendency for the longer fumigations to reduce the chlorophyll content slightly, but this appeared to be without practical significance. Sulfur analyses of the leaves and stems accounted for about 90 percent of the SO_2 added in the short fumigations.

Absorption by the soil was too slight for analytical determination, but a passage outward from the roots to the soil was suggested. The rate of absorption of the gas by the leaves decreased along with the decreasing effects on photosynthesis. Leaf analyses showed large increments of sulfur in the prolonged fumigations, and when the content approached 2 percent the leaf became chlorotic and soon ceased to function. At about 1.5–1.7 percent or less the leaf appeared normal.

"The complete return to its normal level of photosynthesis, following fumigations which did not produce visible injury, would indicate that in such fumigations there is no 'invisible injury', either to the protoplasm or other plant structure."

Development of the root-knot nematode on beans as affected by soil temperature, **G. R. Townsend** (*Florida Sta. Bul. 309 (1937), pp. 15, fig. 1*).—As a result of this study of the activity of *Heterodera marioni* on snap beans under field conditions, it was found that its developmental rate is a function of temperature. Development below 14.75° C. (58.6° F.) would not be expected,

although some may occur as low as 12°. The number of yearly generations increases with rises in temperature, so 10–12 generations per year are possible in southern Florida. About 10,000 hour-centrigrade units above 12° are required for the development of each generation.

Cracked stem of celery caused by a boron deficiency in the soil, E. R. Purvis and R. W. Ruprecht (*Florida Sta. Bul. 307 (1937), pp. 16, figs. 3*).—The trouble described and shown to be a symptom of boron deficiency was prevented by commercial borax applied to the soil around the plants at the rate of 10 lb. per acre about 2 weeks after they were set in the field. Probably the best way to apply such relatively small amounts is in solution, and good results were obtained with spray machines. By this method cracked stem was not only prevented, but a decided increase in yield was obtained. Borax probably must be applied every year to light sandy soils and every second or third year to peats and heavier mineral soils.

More than 10 lb. per acre is not recommended, due to the danger of injurious effects. "Solution culture studies have shown that 0.54 p. p. m. of boron in the nutrient solution produces normal growth of celery. Twenty times this amount does not produce plant injury, but decided toxicity appears when the concentration is increased to 16.2 p. p. m."

Control of southern celery mosaic in Florida by removing weeds that serve as sources of mosaic infection, F. L. Wellman (*U. S. Dept. Agr., Tech. Bul. 548 (1937), pp. 16, figs. 4*).—The weeds most commonly attacked by this virus include cranesbill, two species of *Physalis*, southern pokeweed, ragweed, and wild wandering-jew. The most commonly attacked flowers are periwinkle, snapdragon, zinnia, larkspur, and petunia. The vegetable crops most subject to the disease are beets, carrots, sweet corn, cucumbers, eggplants, parsley, peppers, squash, sweetpotatoes, tomatoes, and celery. The virus was found to persist in the weeds around celery fields (pokeweed and wandering-jew being most important), while it did not remain from season to season in seeds or soil. Spontaneous transmission from plant to plant and host to host is by means of aphids.

Celery mosaic was controlled in the Sanford district by removal of weeds from around the fields, while fields in the vicinity continued to be severely diseased where no attempts were made to destroy the weed hosts. Mere aphid-killing methods (spraying) proved impractical, lacking sufficient thoroughness and area covered. None of the commercial varieties common in Florida, or any foreign varieties resembling them in type, were found to be resistant. Recommendations for control include the eradication of weeds for a distance of 75 ft. or more around seedbeds and fields before planting or transplanting, the procedure to be repeated about five times during the celery-growing season.

A leaf spot disease of red and white clovers, O. F. Smith (*Jour. Agr. Res. [U. S.], 54 (1937), No. 8, pp. 591–599, figs. 4*).—The fungus described (but not named) in this joint contribution by the U. S. D. A. Bureau of Plant Industry and the Wisconsin Experiment Station was found attacking leaves of *Trifolium pratense* and *T. repens* and was proved pathogenic also on leaves of *T. hybridum*, *T. incarnatum*, *T. repens giganteum*, *Melilotus alba*, *M. officinalis*, *M. indica*, and *Medicago sativa*. Lesions are limited to leaf-blade tissues, and under field conditions they consist of dark-brown, often irregular, necrotic areas. Concentric zones are formed around each point of infection, resembling the lesions produced on red clover by *Macrosporium sarciniforme*. With high humidity, aerial mycelium grows above the surface of infected leaves and at each contact point of a hyphal tip with the leaf it develops a group of short diverging hyphae, which serve as organs of attachment to the surface. Direct

penetration of the epidermis occurs at several points beneath these organs of attachment, and the mycelium develops both inter- and intracellularly, killing the host tissues in advance. For growth of the fungus on potato-dextrose agar and for infection of red clover, temperatures of 24° and 28° C. proved more favorable than those above or below. Since no spores or sclerotia were produced, the taxonomic position of the fungus remains undetermined.

Effect of potash fertilizers on cotton wilt, L. E. MILES (*Mississippi Sta. Tech. Bul. 23 (1936), pp. 21, figs. 3*).—Fairly high potash applications combined with nitrogen- and phosphorus-containing salts were definitely beneficial in the control of cotton wilt on the soils of the southern and north-central parts of the State and of the border area of the Yazoo-Mississippi Delta. High nitrate applications and fertilizers containing nitrogen and phosphorus alone were inefficient for wilt control. Potash alone reduced wilt but did not return satisfactory yields. On severely infested soils a cotton variety at least relatively resistant to wilt is essential in addition to a high-potash fertilizer. There was apparently no significant difference in the efficiency of the various sources of potash relative to wilt control.

It is pointed out that in certain parts of the State, particularly in the Delta area, the problem is complicated by the presence of two distinct wilt diseases. Even should it be determined that the disease in question is the *Fusarium* wilt, it is likely that on typical Delta soils naturally high in potash the use of this element may fail to give beneficial results.

Prevalence and significance of fungous associates of pea seeds, W. F. CROSIER (*Assoc. Off. Seed Anal. North Amer. Proc., 28 (1936), pp. 101–107*).—Careful examinations of 6,500 samples by the New York State Experiment Station have indicated that emphasis should be placed on a few organisms and the others regarded as probable, but not common, associates of the seed. *Ascochyta pisi*, *A. pinodella*, and *Mycosphaerella pinodes* occur annually in several samples, and various pathogenic species of *Fusarium* are associated with pea seeds. Statistical analyses are presented on the relation of certain seed associates to the emergence, growth, and stand of peas, including the genera *Fusarium*, *Rhizoctonia*, *Ascochyta*, *Sclerotium*, and *Botrytis*. The association of other pathogenic fungi with commercial seedstocks proved too infrequent to permit statistical treatment, but a partial list is given.

Two mosaic diseases of peas in Washington, F. JOHNSON and L. K. JONES (*Jour. Agr. Res. [U. S.], 54 (1937), No. 8, pp. 629–638, figs. 5*).—Two virus diseases, designated as enation mosaic and severe mosaic, are said to be destructive to pea plantings in Washington, the greatest damage occurring in market-garden and canning peas in the western part of the State.

Seed transmission tests by the Washington Experiment Station indicated the two viruses to be rarely carried in the seed. Severe mosaic has a wide host range among legumes, while enation mosaic is much more limited in its hosts. The two viruses differ in the symptoms induced, in tolerance to dilution, in viability in vitro and in dried plant tissues, in inactivation by heat, and in percentage of infection following mechanical inoculation.

Inheritance of resistance to tobacco-mosaic disease in the pepper, F. O. HOLMES (*Phytopathology, 27 (1937), No. 5, pp. 637–642*).—All tested varieties of the garden pepper (*Capsicum frutescens*) proved susceptible to infection with tobacco-mosaic virus (tobacco virus 1, distorting strain). Four types of response to infection were found. Two of these were known previously, viz, systemic chlorosis and localized necrosis followed by abscission and recovery. A third, here described, is a delayed necrosis, with abscission of affected leaves often allowing the plants to escape systemic spread of the virus. The fourth is a systemic necrosis, with stem streak and eventual death in all plants.

These four responses are controlled by three genes, which form an allelic series. The gene *L* (localization of tobacco-mosaic virus) is completely dominant over l^1 (imperfect localization of virus) and *l* (mottling). The gene l^1 is partially dominant over *l*. Infected plants of genetic constitution *ll* show systemic chlorosis, l^1l^1 delayed necrosis with leaf abscission and recovery in many plants and small numbers of secondary lesions in a few, l^1l systemic necrosis in all plants, and *LL*, *Ll*, and Ll^1 localized necrosis with subsequent recovery.

Resistance of the potato to latent mosaic, E. S. Schultz, C. F. Clark, F. J. Stevenson, and W. P. Raleigh (*Amer. Potato Jour.*, *14* (*1937*), *No. 4*, *pp. 124–127*).—"This paper presents information on the reaction to latent mosaic of potato seedling varieties from two crosses, S 41956 × Katahdin and S 41956 × S. 45075." Although the data obtained are not deemed sufficient to permit a complete genetic analysis of the various reactions, the results are believed to indicate that immunity to latent mosaic of the parent S 41956 was transmitted to a high percentage of the progeny of the two crosses.

Report on potato virus diseases in 1936, T. P. Dykstra (*Amer. Potato Jour.*, *14* (*1937*), *No. 4*, *pp. 117–124*).—This is a review for 1936, including "the papers dealing with timely and general interest . . . and the principal conclusions derived from them", with a bibliography of 30 references.

Correlation between movement of the curly top virus and translocation of food in tobacco and sugar beet, C. W. Bennett (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 7*, *pp. 479–502*, *figs. 6*).—The time required for invasion by the curly top virus varies somewhat with the size of the plant, seedlings probably being almost completely invaded in 2–4 days. In some larger plants over 4 weeks were required for the virus to pass from a mature inoculated leaf to one noninoculated on the opposite side of the plant. In Turkish tobacco (*Nicotiana tabacum*) the virus moved downward more rapidly than upward. In two tests with *N. glauca* the virus moved downward 3 ft. from infected Turkish tobacco grafts at the top and induced symptoms on healthy grafts at the base in averages of 28 and 32 days, respectively. When the positions of the diseased and healthy Turkish tobacco grafts were reversed, the virus required 130 and 302 days, respectively, to move upward and cause symptoms on the top grafts. In some cases it did not reach the tops in an average time of over a year, but when such plants were defoliated at the top the virus moved into the top grafts and induced symptoms in an average of 18 days after defoliation. Other tests indicated that the virus moved only a short distance from the bottom infected graft in 3 mo. in *N. glauca* plants with abundant foliage on the tops, but after top defoliation the virus invaded the upper part of the plants in 14 days or less. When one of the three shoots of a beet plant was infected with curly top and a second shoot was defoliated or held in darkness for 5 days after inoculation, the virus passed into the defoliated or darkened shoot and induced symptoms in an average of 10.6–17.6 days, which was 0.1–5.6 days longer than the average for production of symptoms on the inoculated shoot. The third shoot remained free from symptoms for averages of 55–183 days.

Tests with leafhoppers indicated that the virus moved from inoculated shoots showing symptoms into noninoculated shoots that were both darkened and defoliated in 24–48 hr. When the virus was introduced into the distal end of etiolated beet leaves in darkness it failed to move out of the inoculated leaf in most cases within 21 days, although it moved out of green leaves in light within 4 hr. After etiolated leaves had retained the virus 5 days, it moved out of the inoculated leaf within 24–72 hr. after return of the plants to the light.

The way in which this virus invades the plants indicates that its movement bears little or no relation to its multiplication or to virus concentration gra-

dients, but that it depends on physiological processes occurring in the normal plants. It is apparent that in both beet and tobacco the virus can be prevented from entering certain parts by providing conditions for the synthesis of excess carbohydrates, and that its passage into certain parts can be induced by a food deficit. The data strongly indicate that the virus movement is correlated with food transport and suggest that the virus may be used as an indicator of food translocation. If the virus is such an indicator, its behavior in the plant strongly supports the theory of mass movement of materials in the phloem.

Virus studies.—III, Tomato diseases, W. Newton and H. I. Edwards (*Canad. Jour. Res., 15 (1937), No. 4, Sect. C, pp. 162–167*).—Continuing this series of studies (E. S. R., 77, p. 56), "single virus streak, potato virus X, streak virus X, and aucuba mosaic (tobacco virus 6) were found causing diseases of tomatoes in commercial glasshouses in British Columbia during 1936. Single virus streak was the commonest disease, although greater losses were caused by streak virus X. Aucuba mosaic was found in one case only, but was highly pathogenic. Potato virus X was present mixed with single virus streak, giving rare cases of mixed virus streak. Tomato mosaic (tobacco virus 1) was not present as a tomato disease. Single virus streak serum did not give a precipitate when mixed with aucuba antigen, thus indicating that the viruses are distinct. However, a slight precipitate with tobacco virus 1 antigen did indicate distant relationship with this form. Although three strains of single virus streak could be distinguished by symptoms produced on tomatoes when inoculated simultaneously, these strains proved to be serologically identical."

Pathogenic associates of tomato seed: Their prevalence, relation to field disease, and elimination, J. H. Miller and W. F. Crosier (*Assoc. Off. Seed Anal. North Amer. Proc., 28 (1936), pp. 108–111*).—This contribution from the University of Georgia and the New York State Experiment Station summarizes data on the subject, with special reference to the dissemination of organisms with the seeds. The evidence accumulated in 1935 indicated that commercial seeds were the chief source of all primary infections. A method was developed at Athens, Ga., to determine the presence of important pathogens on the seed and thereby to test the effectiveness of field inspections, of fermentation for bacterial canker, and of chemical seed disinfection (particularly with mercuric chloride). The organisms commonly observed were *Macrosporium solani*, *Bacterium vesicatorium* (=*Phytomonas vesicatoria*), and *Aplanobacter michiganense* (=*P. michiganensis*), while occasional cultures of *Colletotrichum pomoides*, *Phoma destructiva*, and *Fusarium lycopersici* were obtained. Evidence for the translation of the seed load into field disease was found in both 1935 and 1936.

Relation of nutrient salt concentration to growth of the tomato and to the incidence of blossom-end rot of the fruit, W. R. Robbins (*Plant Physiol., 12 (1937), No. 1, pp. 21–50, figs. 8*).—In this contribution by the New Jersey Experiment Stations, tomatoes from a selected strain of the Marglobe variety were grown in sand cultures in the greenhouse with nutrient solutions of osmotic concentrations of 0.08, 0.44, 0.83, 1.7, and 3.1 atmospheres, a comparison also being made of the effects of two rates of supply of the first solution. The detailed effects of these solutions on vegetative growth, fruit set and growth, internal water relations, and dry weights of the various plant parts are noted.

About 80 percent of the fruits grown with solutions of the two highest concentrations developed the physiological disorder blossom-end rot, while with the lowest concentration none developed this condition. Blossom-end rot was associated with wide fluctuations in transpiration rates. A slight amount of cracking of fruits occurred under low transpiration intensities, but only in

plants with the lowest concentration of solution. A difference of about 4 atm. occurred between the osmotic values of extracted juices of similar tissues of plants grown with solutions of the lowest and highest concentrations. An osmotic gradient of 1.62–3.63 atm. existed between the extracted juices of fruit v. stem and leaf tissues in plants grown with the various concentrations of solution, the smallest gradient occurring in plants grown with the lowest concentration.

The significance of the differences in osmotic and imbibitional pressures of fruit, stem, and leaf in the various series and the importance of factors of light, temperature, humidity, air movement rate, and of the pH and oxygen tension of the solutions in relation to the development of blossom-end rot of the fruit in solutions of different nutrient salt concentrations are either noted or discussed. A bibliography of 37 references is provided.

Experiments for the control of Phoma rot of tomatoes, W. B. Tisdale and S. O. Hawkins (*Florida Sta. Bul. 308 (1937), pp. 28*).—It is stated that the *Phoma destructiva* rot has been known in tomatoes shipped from the lower east coast of Florida since 1915, and since then it has been reported to be the most important single cause of spoilage in fruits shipped from the State and second in importance as a single cause of decay in winter-grown tomatoes in transit from certain other Southern States. Experiments during 5 yr. at Homestead indicated that *Phoma* spot occurs extensively there on the foliage of the winter crop during seasons of moderate temperatures and high relative humidities, while during warm, dry seasons the disease is less prevalent and may cause little or no injury. The prevalence was determined by placing mature-green fruits from the plats in storage until they ripened.

Spraying tests indicated that 4–4–50 bordeaux mixture increased the yields of marketable fruits and prevented a high percentage of rot from developing in stored fruits during seasons favorable for its development, but during warm, dry seasons the bordeaux reduced the yields of marketable fruits. The rot was further reduced by washing the fruits immediately after picking with a 5 percent solution of borax, a 1 percent solution of sodium hypochlorite, or a 1–150 solution of sodium polysulfide, each containing 0.5 percent of liquid tar soap as a wetting agent, the borax proving slightly more satisfactory. The best place for applying the treatment was in the field. All forms of mechanical injury in handling and picking while the fruits are wet with fog or dew should be avoided. Chemically treated wraps failed to reduce the percentage of rot in stored fruits.

"Among the varieties tested, Livingston Globe, Marglobe, and Pritchard showed most resistance to both leaf and fruit infection. During the 1935–36 season the Rutgers variety showed most resistance to leaf infection, but because of the hurricane no fruits were available for comparative tests."

The effect of various spray materials on tomato transplants, J. D. Wilson and H. A. Runnels (*Ohio Sta. Bimo. Bul. 185 (1937), pp. 58–65, figs. 3*).—Since various spray materials, particularly bordeaux mixture, had been observed (E. S. R., 77, p. 60) to increase the transpiration rate of plants with definite injury resulting, it was decided to test the effect of these materials upon plants sprayed shortly before or after transplanting. Plants of the usual size for transplanting were sprayed previous to their removal from the seedling flat, transplanting taking place as soon as the leaves were dry and at from 1- to 7-day intervals thereafter.

In pots filled with soil of a medium moisture content bordeaux mixture was consistently found to be very injurious, even causing the death of many of the plants when transplanting took place immediately after treatment. Plants

treated with an oil emulsion (Volck 1-100) were little affected, and Volck added to bordeaux mixture greatly alleviated the injury caused by it. Practically all of the spray materials tested which were capable of increasing transpiration, such as most of the copper-containing compounds, and materials sometimes used as diluents or stickers were found to be more or less injurious in case of immediate transplanting. Some of these materials, however, particularly copper oxychloride and cuprous oxide, caused only negligible injury if a delay of 48 hr. occurred between spraying and transplanting, and even with bordeaux mixture the plants were but little affected if 5 days intervened. Observation also indicated that bordeaux mixture should not be used on newly transplanted plants until they have had the opportunity to reestablish their root systems to the extent that water absorption can keep pace with water loss.

The control of mosses and lichens on fruit and nut trees, P. W. MILLER (*Oreg. Agr. Col. Ext. Bul. 498* (*1937*), *pp. 4*).—Lime-sulfur and bordeaux mixture are stated to be two of the most effective sprays for this purpose. Directions for preparation and application, together with certain precautions, are given.

Calcium and boron contents of the apple fruit as related to the incidence of blotchy cork, W. A. DELONG (*Plant Physiol., 12* (*1937*), *No. 2, pp. 553–556*).—Parallel samples of Stark apples (some visibly affected and others apparently normal), collected from a number of orchards and analyzed for calcium and boron, gave no evidence that blotchy cork results from boron deficiency, nor was there evidence that the boron and calcium contents of the apple are closely related. The previous finding that blotchy cork is associated with a relatively low calcium content of the fruit was confirmed.

Incidence of fire blight in young apple trees in relation to orchard practices, E. M. HILDEBRAND and A. J. HEINICKE (*[New York] Cornell Sta. Mem. 203* (*1937*), *pp. 36, figs. 2*).—The present study involved five varieties of apple trees, 4 yr. old at the beginning and ranging in blight susceptibility from low to high as follows: Delicious, Northern Spy, McIntosh, Cortland, and Rhode Island Greening. The severity of annual injury varied and was correlated with the initial blossom infections. A total injury of 50 ft. occurred in over 50 percent of the Rhode Island Greening trees, the percentages for the other varieties being, roughly, Cortland 18, McIntosh 13, Northern Spy 3, and Delicious less than 0.5. Spur blight was most serious on Cortland. Shoot, branch, and body blight was most serious on Rhode Island Greening, with very little injury on Cortland and Northern Spy and but slight damage to McIntosh and Delicious.

Cultural treatments, as listed in the order of the blight susceptibility induced, were cultivation, alfalfa, and sod.

With pruning once in 3 yr., body blight was about nine times greater than on unpruned trees. In general, nitrogen fertilization increased the total fire blight injury, but branch blight was decreased, probably due to the reduction in spurs which function as courts of infection.

Comparing the trees with alfalfa, cultivation, and sod, alfalfa without nitrogen fertilization gave the most satisfactory results with respect to blight and growth combined. Ringing tended to increase blight susceptibility both in the current and following seasons.

It is concluded that the use of a carefully selected cultural practice in conjunction with other measures, such as blossom bactericides, offers promise for fire blight control, particularly on apple.

The peach mosaic disease, L. M. HUTCHINS (*Calif. Dept. Agr. Spec. Pub. 145* (*1936*), *pp. 60–61*).—This virus disease was successfully transmitted by grafting, but the natural mode of spread has not yet been determined. The symptoms,

incubation period, and rate of spread are briefly discussed. The disease is most serious on the Elberta varieties. It is known to occur in Texas, Colorado, California, Utah, New Mexico, and Arizona.

Incubation period of peach yellows in its insect vector, A. HARTZELL (*Contrib. Boyce Thompson Inst., 8 (1936), No. 2, pp. 113–120, fig. 1*).—To determine the approximate incubation period of this virus in the vector *Macropis trimaculata*, nymphs were allowed to feed on affected seedling peach trees in the greenhouse for periods of 1, 4, 7, and 10 days prior to being placed on healthy trees. Only those of the 4-day series proved infective. The maximum incubation period of the virus as experimentally determined ranged from 10 to 26 days (average 16 days), while the minimum period in one case was from 7 to 8 days. All positive infections were obtained with insects becoming infected as nymphs and allowed to feed on healthy trees during that stage, except for one case where the leafhoppers had transformed to adults on healthy trees during successive transfers, the maximum period in this case being 26 days.

A bibliography of 21 references is appended.

Bunch disease of pecans, J. R. COLE (*Phytopathology, 27 (1937), No. 5, pp. 604–612, figs. 4*).—This disease, which was definitely determined in the spring of 1932 as new to pecans, was first observed in the Red River Valley, near Shreveport, La. It is believed to have first attacked the wild native pecan (*Hicoria pecan*) and the water hickory (*H. aquatica*), both being indigenous to the alluvial river-bottom soils, and to have spread gradually to the susceptible improved varieties of pecans. The disease is known to occur in Louisiana, Mississippi, Oklahoma, and Texas. The brooming of branches and shoots, early foliation of diseased branches in the spring; chlorotic, thin, broad, wavy, and flexible leaves; and, in later stages, dying back of the branches are characteristic symptoms. Certain symptoms resemble rosette and little leaf of pecans, phony peach and peach yellows, and witches'-broom of black locust. Bunch disease was successfully transmitted by grafting diseased Schley scions to healthy Schley stocks. It is probably of virus origin. The Schley and Mahan varieties are very susceptible, while Stuart is highly resistant.

Oklahoma demonstrations in the control of pecan rosette, W. D. ARMSTRONG (*Okla. Pecan Growers' Assoc. Proc., 1936, pp. 75–77*).—This is a brief review of the pecan rosette situation in the State and of progress in the steps being taken to control it, including the soil, spray, and insertion methods of applying zinc sulfate.

Boron-deficiency effects similar in general appearance to bark symptoms of psorosis in citrus, A. R. C. HAAS (*Soil Sci., 43 (1937), No. 4, pp. 317–325, pls. 3*).—Since in this study by the California Citrus Experiment Station boron-deficiency effects imitating the bark symptoms of psorosis were induced in citrus, it is concluded that, although the two diseases apparently originate differently, their effects may be closely similar.

Bacterial leaf spot of begonia, L. MCCULLOCH (*Jour. Agr. Res. [U. S.], 54 (1937), No. 8, pp. 583–590, fig. 1*).—A bacterial leaf spot of cultivated begonias, causing defoliation in severe attacks and unsightly plants and leaves in lighter infections, is shown to be due to *Bacterium flavozonatum* n. sp. Though resembling *B. campestre*, inoculations on cabbage, rutabaga, radish, and horseradish gave negative results, but a very slight infection was sometimes induced on geranium. The disease occurs widely in the United States.

"Warm, moist, poorly ventilated, and crowded conditions favor the development of the disease. Adequate spacing, with regulated temperature and moisture, is usually effective in preventing or in curing the disease. Rapid forcing should be avoided, and spotted leaves should be removed or destroyed."

A bacterial blight of iris, W. W. BURKHOLDER (*Phytopathology, 27 (1937), No. 5, pp. 613–621, fig. 1*).—A bacterial blight of iris leaves, possibly of widespread distribution, is reported in this contribution from Cornell University. It is favored by warm, wet weather and occurs on various species of iris. The pathogen is shown to be a vascular parasite which enters the host plant through wounds. The name *Phytomonas tardicrescens* (=*Bacterium tardicrescens* McCulloch) n. comb. is applied.

Decay in merchantable oak, yellow poplar, and basswood in the Appalachian region, G. H. HEPTING and G. G. HEDGCOCK (*U. S. Dept. Agr., Tech. Bul. 570 (1937), pp. 30, figs. 7*).—This study was conducted from 1924 through 1928, sampling being done in connection with commercial logging operations on 55 plats in 19 localities from New Jersey to Tennessee and west to southeastern Ohio. Data were analyzed on 5,882 trees of white oak, chestnut oak, post oak, red oak, black oak, scarlet oak, yellow poplar, and basswood. The identity of some of the fungi responsible for decay was established through cultures, but insufficient knowledge of the cultural characters of many wood-destroying species precluded their identification by this means.

The percentage of cull for any one species varied considerably with locality, much variation being traced to differences in the amount of basal wounding. The importance of basal wounding was emphasized by the fact that 77 percent of the total cull volume resulted from butt defect, 20 percent from top rot, and 3 percent from miscellaneous causes. The cull percentage increased with the diameter and age of the tree, correlated in part with an increase in proportion of trees wounded at the base as their age and diameter increased.

The height of butt rot increased with tree age up to a certain point, beyond which there was, in some cases, either no increase or a decrease. Through measuring the rot in several hundred logs with rot at one end, while being sawed, a general curvilinear relation was found between the average diameter of rot and the length of the rot column. There was a larger percentage of butt cull in stump sprouts than in seedling sprouts in six of the eight species studied. The most common type of wound on standing timber was that due to fire. Relative to the healing of basal wounds, in oaks the callus folds converged toward each other at an average rate of 0.45 in. per year for trees on good sites, 0.34 in. for medium sites, and 0.31 in. for poor sites. For yellow poplar the rate was 0.73 in. for good and 0.33 in. for medium sites. Of trees on which no basal wounds were found, only 6 percent showed butt rot, with 1.5 percent culls, while of trees with basal wounds 67 percent showed butt defect, with 15.5 percent culls. The butt-cull volume increased with width of basal wound and with tree age at time of wounding.

"The increase in cull percentage with increase in tree diameter and percentage of trees with basal wounds is presented by means of three variable graphs. By determining the percentage of trees with basal wounds for each diameter class, the cull percentage for a stand of the species studied, if primarily of seedling or seedling-sprout origin, may be approximated from these graphs."

Preliminary studies of the transfer of four strains of Ditylenchus dipsaci (Kühn 1858) Filipjev 1936, R. J. HASTINGS and W. NEWTON (*Canad. Jour. Res., 15 (1937), No. 4, Sect. C, pp. 168–174*).—"The bulb and stem nematode, *D. dipsaci*, attacks narcissus, iris, red clover, and strawberry in the Pacific Northwest. The isolations from each of these important crops are herein described as strains. Preliminary studies of the transfer of these strains establish the existence of three strains of *D. dipsaci* in the Pacific Northwest, viz: (1) Red clover strain, characterized by causing swollen crowns and stunt in red clover seedlings; (2) strawberry strain, characterized by a limited host

range, swollen crowns in strawberry seedlings, and entrance into red clover seedlings without visible tissue reactions; [and] (3) narcissus and iris strain, characterized by a wide host range and entrance into clover and strawberry seedlings without visible tissue reactions.

"No satisfactory technic of establishing the host range of the biological strains of *D. dipsaci* has been developed. The clamping of glass rings filled with a nematode suspension in moist pulverized peat to the foliage of test plants did not affect the test plants in a constant manner. The examination of seedlings after clarification in a lactophenol solution containing acid fuchsin gave more constant results. The seedlings were removed from infested soil shortly after they appeared above ground. The reports of host specificity of the red clover strain were not confirmed, for the red clover strain entered white clover and alfalfa, hitherto considered resistant. Likewise, the reports of host specificity of the narcissus strain were not supported by our experimental results. The narcissus strain entered red clover and oats, also considered resistant hitherto."

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Work in economic zoology and entomology by the New Jersey Stations] (*New Jersey Stas. Rpt. 1936, pp. 32, 33, 40, 41, 48–53, 103*).—Work of the year (E. S. R., 75, p. 658) with oysters includes production of seed oysters, open shore and claire culture of oysters, filtration of water by oysters and the factors influencing it, and the eradication of oyster drills in Delaware Bay. Entomological work reported includes blueberry fruitworms (the cherry fruitworm and the cranberry fruitworm); the blueberry maggot; mosquito investigations and control; investigations of climate and insects, spraying for orchard and vegetable insects, action of insecticides, soil-infesting insects, bees, and ornamental plant insects; and a study of the relation of the microbiological population of the soil to the destruction of Japanese and other beetles.

[Work in economic zoology and entomology by the Wisconsin Station] (*Wisconsin Sta. Bul. 438 (1937), pp. 61–64, 121–128, figs. 3*).—Reference is made (E. S. R., 75, p. 512) to the increase of the farm game population at Riley; the response of prairie chickens and sharp-tailed grouse to fall and winter feeding, by F. J. W. Schmidt (E. S. R., 76, p. 821); the value of early application of cutworm bait, by H. F. Wilson and C. D. Harrington; use of fly sprayers, by E. M. Searls and F. M. Snyder; attack of alfalfa by the false chinch bug and the tarnished plant bug during the drought of 1936, by Searls; control of the striped cucumber beetle by derris and reduction of effectiveness of derris for cabbageworms caused by alkaline carriers, both by T. C. Allen; effective control of pea aphids by derris, by J. E. Dudley, Jr., T. E. Bronson, and F. E. Carroll of the U. S. D. A. Bureau of Entomology and Plant Quarantine; control of the three-lined potato beetle, by C. L. Fluke; and control of insects (principally the fruit tree leaf roller, eye-spotted budmoth, and cherry casebearer) in Door County apple orchards, including the effects of dormant oil sprays on the growth of apple trees, by J. H. Lilly.

Flight speed of birds, M. T. Cooke (*U. S. Dept. Agr. Circ. 428 (1937), pp. 14*).—In this contribution, based upon a review of the literature (86 references to which are listed) and records of the Bureau of Biological Survey, the speed of flight of birds is principally dealt with. Reference is also made to the altitude of migratory flights and the mechanics or aeronautics of flight. A brief introduction is followed by a discussion of estimated speeds, measured speeds, and variations in speed, including the effect of wings and weight and influence of wind. The details are given in a table (pp. 6–9) of the species observed,

with their speeds in miles per hour, timing device used, place, authority, and remarks.

Further notes on the food and habits of Trinidad birds, with special reference to common cane field birds, D. Vesey-FitzGerald (*Trop. Agr. [Trinidad], 13 (1936), No. 1, pp. 12–18*).—Examinations of an extensive series of stomachs of some 50 species of birds collected in Trinidad in July and August 1931 are reported upon, followed by an annotated list of 17 references to the literature.

The birds of St. Kitts and Nevis, S. T. Danforth (*Trop. Agr. [Trinidad], 13 (1936), No. 8, pp. 213–217*).—An annotated list of 63 forms from St. Kitts and Nevis.

Costs and profits in oyster drill control, L. A. Stauber and G. M. Lehmuth (*New Jersey Stas. Bul. 624 (1937), pp. 10, figs. 3*).—This contribution deals with the oyster drill or borer, a detailed account of the life and habits of which have been noted in Bulletin 523 (E. S. R., 65, p. 243). Methods for its control, with description of the drill dredge, the chicken-wire trap, and a third practical method of control by the use of large mesh-iron screens on boats, are presented. It is pointed out that of these methods the drill dredge is useful in clearing an oyster bed of drills before seed oysters are planted on it in the spring of the year; that trapping is the most important single method since it decreases the destruction caused by the drills at the most crucial stage in the life of the oyster, when the oysters are young and most easily drilled, and because it removes borer eggs; and that screens on the boat deck should be used during replanting and harvesting of oysters.

In the calculations of costs and profits here reported, 20 was used as the number of oysters that can be destroyed by one borer in a season because that is the most conservative figure in the records.

Common names of insects approved for general use by the American Association of Economic Entomologists (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 527–560*).—This is a compiled list of the common names of insects thus far approved by the association and a list of the scientific names (E. S. R., 73, p. 807).

Dissemination of insects by air currents, E. P. Felt (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 458–461*).—The results obtained in the release of 4,935 balloons between May 9 and July 23, 1936, from points in Connecticut, New York, and New Jersey in their bearing upon the spread of certain insect pests, particularly the smaller European elm bark beetle, are considered.

[Notes on economic insects and their control] (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 560–564*).—The notes here presented (E. S. R., 77, p. 359) are as follows: Oxygen as a Factor in Vacuum Fumigation, by R. T. Cotton, G. B. Wagner, and H. D. Young (p. 560); Greatly Increased Yields of Peanuts Obtained in Attempts to Control Potato Leafhopper, by F. W. Poos and E. T. Batten (p. 561), U. S. D. A. Bureau of Entomology and Plant Quarantine and the Virginia Experiment Station; Zinc Oxide-Zinc Acetate Mixture as a Safener for Arsenical Sprays, by R. H. Robinson and L. Childs (pp. 561, 562), Oregon Experiment Station; Effect of Ferric Oxide on Acid Lead Arsenate as a Stomach Poison and Repellent for Japanese Beetle, by W. E. Fleming and F. E. Baker (p. 562); *Lariophagus distinguendus* Foerst. Parasitic on *Sitodrepa panicea* L. in New York, by L. L. Pechuman (p. 563); New Technic for Hatching Codling Moth Eggs, by D. Powell (pp. 563, 564), Illinois Natural History Survey and Illinois Experiment Station; and Improved Poisoned Bait for Corn Root Webworm Affecting Tobacco, by J. U. Gilmore and J. Milan (p. 564).

Records of southern insect species moving northward during the drouth years of 1930 and 1934, H. H. Knight (*Ann. Ent. Soc. Amer., 29 (1936), No. 4, pp. 578–580*).—A brief account is given of the fluctuating range of a few species taken at Ames, Iowa, which is said to be as great as from 300 to 500 miles in a north and south direction.

Further notes on the food-plants of Nigerian insects, IV, F. D. Golding (*Bul. Ent. Res., 28 (1937), No. 1, pp. 5–9*).—Observations made from November 1934 to March 1936, in continuation of those previously noted (E. S. R., 73, p. 808), are reported.

The need of permanent reference collections of insect vectors of plant diseases, F. F. Smith (*Phytopathology, 27 (1937), No. 2, pp. 198–202*).—Attention is directed to the desirability of bringing together representatives of all available bona-fide and present-known insect vectors of plant viruses in one or more leading institutions conducting research on virus diseases. These should serve as repositories for such material from future investigators.

[Rice insect work by the Louisiana Rice Station] (*Louisiana Sta., Rice Sta. Bien. Rpt. 1935–36, pp. 12, 13, 16–19*).—A review of the progress of work with rice field insects is presented by W. A. Douglas and of insect control in stored rice by C. L. Stracener.

Insects attacking sugar-cane on the island of Tobago, B. W. I., D. Vesey-FitzGerald (*Trop. Agr. [Trinidad], 13 (1936), No. 8, pp. 199, 200*).—An account of the occurrence of insect damage on a neighboring island of Trinidad.

Notes on sugar cane in west Africa, R. H. Van Zwaluwenburg (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 41 (1937), No. 1, pp. 7–12, figs. 5*).—Observations made of the animal enemies of sugarcane during the course of a trip of investigation from November 9, 1935, to July 28, 1936, in west Africa are reported. The village weaver or palm bird (*Ploceus cucullatus cucullatus*), which strips the leaves of sugarcane, bananas, and palms to weave into its hanging nests, was found to be the most conspicuous pest of cane in Sierra Leone. It was also observed in Liberia, Ivory Coast, Gold Coast, and Nigeria, and a similar form in Cameroun (Cameroons). A cercopid, *Locris maculata* Fab., which feeds upon corn and grasses in general is the most common and most widespread insect attacking sugarcane in Sierra Leone, being also found in the Gold Coast, Nigeria, and Cameroun. Pyralid moth borers were observed to occur all the way from Sierra Leone to Angola, and their ravages, while not comparable to the sugarcane borer in the American tropics, have to be reckoned with. The nutgrass armyworm occurs from Sierra Leone eastward, at least into Nigeria. A list is given of 16 forms of west African rutelid beetles.

Control of insects commonly affecting tobacco plant beds, H. H. Jewett (*Kentucky Sta. Circ. 47 (1937), pp. 9–23, figs. 7*).—A practical account of control measures for insects attacking tobacco plants in the seedbed.

Biological control in the West Indies, R. G. F[ennah] (*Trop. Agr. [Trinidad], 13 (1936), No. 8, pp. 197–199*).—A review of the status of the biological control of insects in the West Indies.

The introduction and colonization in Puerto Rico of beneficial insects, K. A. Bartlett (*Puerto Rico Sta. Agr. Notes No. 75 (1937), pp. 8*).—The introductory work with beneficial insects for the control of crop pests in Puerto Rico, commenced in July 1935 and conducted in cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine, is reported upon.

The search in the American tropics for beneficial insects for introduction into Puerto Rico, S. M. Dohanian (*Puerto Rico Sta. Agr. Notes No. 76 (1937), pp. 7*).—A search conducted in the British West Indies and in certain

South American countries from August 12, 1935, to May 21, 1936, is reported upon. The work resulted in the introduction of parasites of the sugarcane borer from British Guiana, Peru, and Trinidad, of the coconut thrips parasite *Dasyscapus parvipennis* from Trinidad, an account of which by the author has been noted (E. S. R., 77, p. 71), and of several effective predators of the coconut scale *Aspidiotus destructor* from Trinidad.

An examination of commercial calcium arsenates, O. A. Nelson and C. C. Cassil (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 474–478, fig. 1*).—The results of analyses of various brands of commercial calcium arsenate on the United States market in 1936 by the only available method are reported in table form, and for comparison figures are given concerning the same brands as sold in previous years.

Particle size of commercial calcium arsenates by sedimentation analysis, L. D. Goodhue (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 466–474, figs. 4*).—Determination of the particle-size distribution, the loose bulking value, the density, and the angle of slope for 22 commercial calcium arsenate samples is reported upon.

"The particle-size distribution and loose bulking value varied greatly, while the density and angle of slope showed less variation. The special grades produced by some of the companies were, in every case, finer than their standard grades. A comparison of the loose bulking values and the particle-size sedimentation showed little correlation. It is pointed out and substantiated by photographs that the bulking value so often used as a measure of particle size is unreliable and often entirely misleading. A correlation between density and particle size has been pointed out. The finest samples have the highest densities."

Stickers used with calcium and zinc arsenates, F. Sherman III (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 398, 399*).—Work by the Michigan Experiment Station with several stickers in commercial orchards during the season of 1936 has led the author to conclude that calcium and zinc arsenates combined with proper correctives and certain stickers will closely approximate lead arsenate as a poison for codling moth under average Michigan conditions.

Adherence and rate of settling of lead arsenate dusts for autogiro and airplane application, C. C. Hamilton (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 399–404*).—Studies conducted by the New Jersey Experiment Stations for the purpose of modifying lead arsenate dusts in order that they could be satisfactorily applied by autogiro or airplane for the control of cankerworms or similar leaf-eating insects have shown that mixtures of oil with lead arsenate materially increased the adherence of the lead arsenate to oak folige. "Fish oil gave the best adherence of the oils tested. Adherence of the lead arsenate was directly proportional to the amount of oil mixed with the lead arsenate. The rate of settling of lead arsenate could be increased by adding oil, and this rate of settling was directly proportional to the amount of oil added to the lead arsenate. Rate of settling of mixtures of Celite, oil, and lead arsenate was increased as the amount of oil was increased. Within limits the finer the particles of Celite the slower the settling of the dust mixtures. The finer the particles of Celite the better the distribution of the dust mixtures on the glass plates. The physical properties of the dust from the standpoint of rate of settling and adherence to glass plates were improved by adding Celite to the oil and lead arsenate mixtures."

Stickers and spreaders used in lead arsenate sprays for codling moth control, S. W. Harman (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 404–407, fig. 1*).—In tests made by the New York State Experiment Station during the season

of 1936 with various spreading and sticking agents used with lead arsenate sprays for combating heavy infestations of the codling moth, soybean flour gave the most satisfactory results. Used at the rate of 1 lb. in 100 gal. in combination with lead arsenate and hydrated lime, it produced a heavy, even coating of spray residue on the fruit which gave the most effective control and was removed from the picked fruit without difficulty.

Five years' experiments with lead arsenate-summer oil in codling moth control, B. F. DRIGGERS (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 407–413*).—A spray schedule of oil and lead arsenate for codling moth control was compared by the New Jersey Experiment Stations with a spray schedule of lead arsenate-lime-milk on several varieties of apples over a 5-yr. period at Moorestown and Glassboro. "No cumulative injury from the use of the oil has been observed to date. More foliage injury of a seasonal nature was observed on oil-lead arsenate-sprayed plats than on lime-lead arsenate-sprayed plats. This injury was not sufficiently pronounced, however, to vitiate the improved codling moth control observed. The use of oil with lead arsenate at the peaks of egg deposition improved the codling moth control over a schedule of lead arsenate-lime-milk. An oil emulsion used with lead arsenate gave slightly better control than a miscible oil used with lead arsenate. Three yr. of tests with home-made oil emulsions used with lead arsenate gave control of codling moth slightly better than that obtained with a commercial oil emulsion and lead arsenate, with no difference observable in fruit or foliage injury. The results show that summer oils have a place in the apple spray program in the heavily infested orchards in the two-brood area of southern New Jersey."

Effect of certain codling moth spray schedules on other orchard insects, C. R. CUTRIGHT (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 413–417*).—The use by the Ohio Experiment Station of phenothiazine in the experimental control program throughout the season of 1936 on several varieties of apple failed to control satisfactorily the codling moth, European red mite, and plum curculio but reduced the population of the apple aphid. "Oil-orthonicotine controlled green apple aphid and red mite, but injury by curculio and codling moth was severe. When lead arsenate was used in the calyx and followed by either phenothiazine or oil-orthonicotine schedules, control of codling moth, and particularly plum curculio, was greatly improved over the all-season use of these materials."

Tests of cattle fly sprays by the "one-half cow" method, D. MACCREARY and A. H. GODDIN (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 478–482*).—Data pertaining to the "one-half cow" method of testing cattle fly sprays are contributed from the Delaware Experiment Station. It is concluded that, while the validity of the method is open to question, if valid certain advantages are offered. A significant difference in the percentage of stable flies on the treated side was obtained between certain sprays. Analysis of the data pertaining to horse flies indicates that these data are meaningless.

Relative toxicity of the cresols as demonstrated by tests with Carassius auratus, W. A. GERSDORFF (*Jour. Agr. Res. [U. S.], 54 (1937), No. 6, pp. 469–478, figs. 2*).—A further study (E. S. R., 77, p. 69) made of the toxicity of the cresols (*o*-cresol, *m*-cresol, and *p*-cresol) with respect to concentration and survival time at 27° C., the results being compared with each other and with those for phenol and rotenone, is reported.

"Goldfish of the same lot, weighing approximately from 6 to 7.5 g each, were used as the test animals. The type of toxic action of the cresols was found to be similar to that of phenol. According to the minimum product of concentration and survival time, which measures toxicity at its range of

most powerful action, *m*-cresol is slightly less toxic than phenol, *o*-cresol is one-fifth more toxic, and *p*-cresol is nearly twice as toxic. Phenol, according to this measure, is only 0.003 as toxic as rotenone. The phenolic compounds do not differ much at the extremes of their ranges of toxic action. They differ mainly in the acceleration of this action with increase in concentration. Four methods of comparison in the range of greatest acceleration show that the compounds bear the following ratios of toxicity: *m*-cresol 1.0, phenol 1.1, *o*-cresol 1.3, and *p*-cresol 2.0. The same criteria show rotenone to be about 360 times as toxic as *m*-cresol. If time is not considered in the measure of comparison, and the compounds are compared according to concentrations necessary to kill under certain conditions, the values for the relative toxicity of the phenolic compounds are changed but little, if at all, but rotenone is favored to such an extent that its relative toxicity becomes 3,000 times that of *m*-cresol."

"The relative toxicity of these phenolic compounds according to the minimum lethal dose by subcutaneous injection found by other investigators for the rabbit, mouse, cat, rat, and guinea pig is close to that given above."

A list is given of 21 references to the literature.

Karaya gum in nicotine sprays, C. O. Eddy and C. M. Meadows (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 430–432*).—In experiments conducted first at the Kentucky Experiment Station (E. S. R., 76, p. 67) and later at the Louisiana Experiment Station in which *Tritogenaphis ambrosiae* (Thomas) on the great ragweed (*Ambrosia trifida*) was found to be a difficult aphid to kill with nicotine sulfate-soap spreader combinations, karaya gum greatly increased their effectiveness. By using the gum 1:500, one-fifth to one-third of the nicotine sulfate was effective.

In similar experiments with the bean aphid, nicotine sulfate-soap spreader combinations killed as effectively at 1:2,000 with karaya gum (1:500) as at 1:800 without the karaya gum. Karaya gum-soap spreader combinations without nicotine were ineffective.

Grenz radiographs of sulfur dispersion on foliage, G. F. MacLeod and H. F. Sherwood (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 395–398, figs. 3*).—The need for a rapid, accurate method of depicting sulfur residues on foliage, which arose in the course of some general investigations of sulfur as an insecticide, led to the preliminary tests with Grenz-ray radiography here briefly reported. The work has indicated that it will provide an accurate and rapid method.

Rotenone-bearing plants and pyrethrum, F. L. Campbell (*Ohio Veg. Growers Assoc. Proc., 22 (1937), pp. 11–18*).—This includes a tabular comparative summary of information on rotenone-bearing plants and pyrethrum.

Results of experimental work with rotenone-bearing materials for the control of vegetable insects, N. F. Howard and H. C. Mason (*Ohio Veg. Growers Assoc. Proc., 22 (1937), pp. 19–24*).—A practical discussion of the value of rotenone-bearing materials in combating vegetable insects.

An annotated list of the dragonflies (Odonata) of Ohio, D. J. Borror (*Ohio Jour. Sci., 37 (1937), No. 3, pp. 185–196*).—One hundred and twenty-seven forms are listed and records given of the counties in which they are known to occur.

Preliminary report on termites and termite damage in Trinidad, West Indies, A. M. Adamson (*Trop. Agr. [Trinidad], 14 (1937), No. 5, pp. 141–149, pls. 2*).—Brief notes are given on the occurrence, habits, and probable economic status of the principal genera and species of termites of Trinidad, where over 30 species, representing some 20 genera, have been collected.

The mechanism of respiration of locusts and its bearing on the problem of inhalation of poison dusts, A. G. HAMILTON (*Bul. Ent. Res., 28 (1937), No. 1, pp. 53–68, figs. 2*).—Measurements made of the spiracles and the tracheae of fifth instar hoppers and adults of *Locusta* and adults of *Schistocerca* have shown that particles of dust which have passed a 300 British standard sieve (i. e., under 0.053 mm in diameter) are small enough to enter all the spiracles, and that the particles which have passed a 150 British standard sieve (i. e., under 0.104 mm in diameter) can enter spiracles 1 to 4 and 10.

"It has been proved by the presence of particles of dust in the respective spiracles that spiracles 1 to 4 are inspiratory in function and spiracles 5 to 9 expiratory under all conditions, while the function of spiracle 10 is expiratory when the locust is flying and inspiratory when it is motionless. The quantity of dust present in the treacheae increases with the length of exposure to the cloud of dust; the quantity present after 10 seconds' exposure is not regarded as sufficient to kill the locust. The action of external poisons is thought to be by direct penetration of the integument or through the nerve endings or both. The results given in this paper suggest that further work on the action of poison dusts should be concentrated on the investigation of direct penetration of the integument and of the nerve action, rather than poisoning through the respiratory system."

The hollyhock thrips Liothrips varicornis Hood, S. F. BAILEY (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 448–450, fig. 1*).—Observations of *L. varicornis*, which has come to attention in California, are reported. This thrips appears to be limited to a semiarid climate and is found principally on the hollyhock. It does not require control measures because of the short growing season of the host plant and its minor importance as a pest.

Effect of different spreaders on thrips control by nicotine, C. O. EDDY and S. S. SHARP (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 427–430*).—In observations by the Louisiana Experiment Station the tobacco thrips, flower thrips, and onion thrips were found to injure garden and truck crops in that State. The tobacco thrips was by far the most destructive, especially to shallots, onions, and cabbages, and was used in the toxicity tests. The experiments reported have shown that the failure of spray mixtures containing nicotine sulfate to kill tobacco thrips is due to a deficiency in several spreaders which is corrected by the addition of potassium hydroxide. Karaya gum added to the sprays markedly increased their effectiveness.

Two hemipterous enemies of the Mexican bean beetle in Ohio, W. C. STEHR and W. FARRELL (*Ohio Jour Sci., 36 (1936), No. 6, pp. 332, 333*).—Notes are given on two predatory enemies of the Mexican bean beetle, namely, the pentatomid bug *Perillus circumcinctus* Stål, the female of which was found feeding on the adult beetle, and the wheel bug, the nymph of which fed on both the larva and adult beetle.

Histological studies of the digestive system of the squash bug, Anasa tristis DeG. (Hemiptera, Coreidae), E. P. BREAKEY (*Ann. Ent. Soc. Amer., 29 (1936), No. 4, pp. 561–577, figs. 26*).—This contribution on histological studies of the alimentary canal and its appendages and the salivary glands is presented with a list of 21 references to the literature cited.

Experiments to control hairy chinch bug infesting turf on Long Island, G. F. MACLEOD and K. E. MAXWELL (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 432–437, figs. 2*).—A report is made of experimental control work with the two broods of the hairy chinch bug on Long Island in which applications for the first brood were made during the first half of June and those for the second during the first half of August, after most of the eggs had hatched but before the young

bugs caused damage. Satisfactory control of heavy infestations was obtained "by each of the following materials, using two applications against each brood: Tobacco dust containing 1 percent nicotine or cube dust containing 1 percent rotenone at the rate of 25 lb. to 1,000 sq. ft. for each application, or a spray consisting of 40 percent nicotine sulfate 1:400 with 40 percent potassium oleate soap 1:100 applied at the rate of about 240 gal. to 1,000 sq. ft. In some cases one application gave adequate control. Two applications against each brood were more effective than one in reducing populations, and one application of 50 lb. of dust was more effective than one of 25 lb. to 1,000 sq. ft. Tobacco and rotenone dusts gave consistently better results than the nicotine-soap sprays, and the latter caused burning in each case. Tobacco dust was equal or superior to the other materials and was more satisfactory from the standpoint of cost. The evidence indicated that the tobacco dust need not be watered in. In an experiment dealing with a light infestation of chinch bugs, tobacco dust containing 0.75 percent nicotine and cube dust containing 0.5 percent rotenone gave effective control."

White coating on foliage a repellent for potato leafhopper, E. I. McDaniel (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 454–457*).—Field experiments (E. S. R., 75, p. 511) conducted in Michigan in 1935 and 1936 on dahlia, potato, and alfalfa have shown that the potato leafhopper is repelled by a white, inert coating, such as infusorial earth, talc, and flour, on the foliage.

Food plants of the United States forms of the leafhoppers of the genus Agalliopsis, E. D. Ball (*Ann. Ent. Soc. Amer., 29 (1936), No. 4, pp. 650–655*).—An account is given of the species of *Agalliopsis* occurring north of Mexico, with notes on the food plants of the 15 species recognized.

The control of froghopper blight, A. Pickles (*Trop. Agr. [Trinidad], 14 (1937), No. 1, pp. 5–9*).—A discussion of the control problem in the West Indies.

Pea aphid control in Maryland, C. Graham (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 439–443*).—Five years' control work with the pea aphid, which in 1932 seriously threatened the pea industry of Garrett County, has shown that soap and nicotine sprays will give a large decrease in aphid infestation and an increase in the yield of shelled peas ranging from 13.2 to 104.9 percent over unsprayed peas.

"One year's experience with derris dust containing rotenone without spreader showed a slight decrease in aphid infestation and no increase in yield of peas over the unsprayed plats. The next year's experience with derris dust containing rotenone with spreader showed a decrease in aphid infestation in those plats that had an initial infestation and an increase in yield of peas ranging from 128.3 to 404 percent over the unsprayed plats. Highest yields, however, were from plats having no initial infestation. From the information obtained in these experiments it appears that the correct time to make the first application of spray is when the first aphids appear in the field. If the aphids come in about 10 days before the blooming period, it is advisable to apply a second application at the time the peas begin to bloom. However, if the aphid infestation starts at blossoming time only one application is necessary or economically useful."

Descriptions of some rabbit brush and willow aphids, G. F. Knowlton and C. F. Smith (*Ann. Ent. Soc. Amer., 29 (1936), No. 4, pp. 776–778, figs. 2*).—Contributing from the Utah Experiment Station, *Cavariella hendersoni* from *Salix* and *Aspidaphis adjuvans rowei* from *Chrysothamnus*, both from Utah, are described as new to science.

Additions and corrections to the "Aphidae of Colorado", M. A. Palmer (*Ann. Ent. Soc. Amer., 29 (1936), No. 4, pp. 729–748, figs. 21*).—This contribution

from the Colorado Experiment Station, which supplements the synopsis of the Aphididae of Colorado, by Gillette and Palmer (E. S. R., 72, p. 659), furnishes information on the morphology, classification, and distribution of many forms, and includes an additional host plant list of records.

The rhododendron whitefly and its control, R. Latta (*U. S. Dept. Agr. Circ. 429 (1937), pp. 8, pls. 4, figs. 3*).—This contribution deals with studies of the rhododendron white fly *Dialeurodes chittendeni* Laing, now prevalent in parts of England, but only recently discovered in the United States, having been intercepted in 1932 on rhododendrons imported from England. It appeared in 1933 at Seattle, Wash., and in 1934 on Long Island, N. Y., on rhododendrons imported from England. It was discovered in 1935 to occur on native rhododendrons growing wild in eastern Tennessee and in 1936 on plants shipped from White Sulphur Springs, W. Va., and Stroudsburg and Germantown, Pa. There are now well-established infestations near Seattle and Tacoma, Wash., and on Vancouver Island and in the Fraser River Valley, British Columbia. The account, which is presented as a source of information to nurserymen and gardeners, reports briefly on studies of the pest conducted chiefly in the Pacific Northwest.

This white fly seriously impairs the ornamental value of susceptible species and varieties of rhododendrons, the susceptibility to attack of varieties varying because of physical differences in the structure of their leaf surfaces. It was found that in western Washington there is "only one generation a year, which corresponds with conditions reported in England. The overwintering forms are principally the second- and third-instar larvae. The natural spread from plant to plant is slow because the adults apparently prefer to remain on the plant on which they developed. Oil sprays can be successfully used for the immature stages, a 2-percent spray giving satisfactory control, but twice that strength is desirable if eradication is attempted. Nicotine, either as a spray or dust, can be used to reduce adult populations."

Bemisia nigeriensis Corb., a vector of cassava mosaic in southern Nigeria, F. D. Golding (*Trop. Agr. [Trinidad], 13 (1936), No. 7, pp. 182–186*).—In reporting further,[3] transmission experiments with *B. nigeriensis* have confirmed the earlier conclusion and proved that this species is a vector of cassava mosaic. In two experiments conducted, mosaic symptoms appeared 27 days after the adult *Bemisia* had been placed in chimneys, each containing a healthy plant. The maximum intervals between the introduction of *Bemisia* and the first appearance of mosaic symptoms were 13, 19, and 21 days, respectively. The attempted transfer of mosaic from cassava to *Manihot glaziovii* and *Euphorbia heterophylla* resulted negatively.

Studies on the transmission of pea virus 2 by aphids, H. T. Osborn (*Phytopathology, 27 (1937), No. 5, pp. 589–603, figs. 4*).—In experiments conducted, the mosaic pea disease virus, designated as pea virus 2, was transmitted by both nymphs and adults and by single individuals of the potato aphid, the bean aphid, and the pea aphid. "It was found that colonies of each of these aphids are able to acquire the virus during a feeding period of 5 min. on a diseased plant and are able to transmit it to a healthy plant during a 5-min. period immediately following. Some colonies lost the virus during a period of 15 min. on healthy plants. Retention of the virus for more than 1 hr. was not demonstrated in any colonies allowed to feed continuously on healthy plants for 1 hr. When held without access to food, the bean aphid was shown to retain the virus for 5 hr., the pea aphid for 8 hr., and the potato aphid in one instance for 24 hr. No incubation period of the virus was observed in colonies

[3] Trop. Agr. [Trinidad], 12 (1935), No. 8, p. 215.

of the pea, potato, or bean aphids that were fed for 1 day on diseased plants and were then transferred to a succession of healthy plants for a total period of 14 days."

Notes on the yellow aphis of sugar-cane Sipha flava Forbes, F. A. SQUIRE (*Trop. Agr.* [*Trinidad*], *14* (*1937*), *No. 1*, *pp. 3, 4*).—Notes on the biology of *S. flava* and means for its control are presented.

The immature stages of some Minnesota Trichoptera, W. A. ELKINS (*Ann. Ent. Soc. Amer.*, *29* (*1936*), *No. 4*, *pp. 656–681*, *pls. 6*).—Descriptions are given of the immature stages of eight species of Trichoptera studied in Minnesota.

Lineodes integra Zell., a potential pest of greenhouse tomatoes, C. C. COMPTON (*Jour. Econ. Ent.*, *30* (*1937*), *No. 3*, *pp. 451–454*, *fig. 1*).—This lepidopteran, not previously recorded as a pest of the tomato crop, has been found capable of causing severe damage to tomatoes grown in the greenhouse. All parts of the plants above the ground are subject to attack, the principal damage being caused by feeding of the larvae on the fruit.

"A sulfur-lead dust made up of 85 parts by weight of 300-mesh dusting sulfur and 15 parts by weight of lead arsenate gave the most satisfactory control. Arsenicals are not recommended when the fruit is ripening unless the fruit is to be washed. A derris dust containing 0.5 percent rotenone with talc as a diluent gave commercial control under greenhouse conditions. A pyrethrum spray containing 6 percent pyrethrum extractives was effective in killing all larvae thoroughly wet with the spray. The expense was greater than with the dusts."

[A pyralid enemy of cauliflower in the West Indies], R. C. WOOD and H. M. JAMES (*Trop. Agr.* [*Trinidad*], *13* (*1936*), *No. 8*, *pp. 219, 220*).—Observations of a severe attack of young cauliflower plants by the caterpillars of *Hellula phidilealis*, its most important pest, life history notes, and means of control in the West Indies are presented.

Tests with bait and light to trap codling moth, H. N. WORTHLEY and J. E. NICHOLAS (*Jour. Econ. Ent.*, *30* (*1937*), *No. 3*, *pp. 417–422*).—Tests commenced by the Pennsylvania Experiment Station in 1934 with a view to developing a trap equally as effective as, but less expensive than, that described by Parrott and Collins (E. S. R., 73, p. 75) are reported upon. The tests conducted in 1934 and 1935 have shown that the effectiveness of bait traps may be greatly increased by suspending them underneath 75-w lights.

"Results obtained in three seasons appear to show that a trap costing $1.50 to make, and consisting of a light and reflector suspended above molasses-water bait in a pan 12 in. in diameter, is more effective in killing codling moth adults than an electrocuting light trap that sells for about $15. . . . Employed in commercial orchards to reduce codling moth populations, the combination bait and light trap would be somewhat more expensive to operate than the electrocuting trap. The latter is automatic, while the former must be cleaned frequently and recharged with bait about every 10 days. However, the cost of bait and labor would scarcely equal interest on the extra investment in the electrocuting traps. Preliminary tests with the trapping light globes are encouraging, and means of increasing their effectiveness should be sought. The use of Anethol as an attrahent with bait in 1934 increased the catch of female moths more than five times."

Effects of light traps on a codling moth infestation: A consideration of four years' data, D. L. COLLINS and W. MACHADO (*Jour. Econ. Ent.*, *30* (*1937*), *No. 3*, *pp. 422–427*, *figs. 3*).—The data on codling moth injury and population in an apple orchard equipped with light traps, based upon work by the New York

State Experiment Station, Cornell University, and U. S. D. A. Bureau of Entomology and Plant Quarantine cooperating over a period of 4 consecutive years, are here assembled and compared. The charts and data presented indicate "that the light traps exerted an influence on the codling moth infestation sufficient to be reflected in a measurable decrease in injury to the fruit. An evaluation of this influence on the basis of the different methods of comparison used leads to the inference that, under the given experimental conditions, the control achieved by light traps was comparable to that secured by the application of two cover sprays of lead arsenate."

Utilizing parasites in controlling the oriental fruit moth, D. M. Daniel (*Ann. Ent. Soc. Amer., 29 (1936), No. 4, pp. 640–644*).—Contributing from the New York State Experiment Station, a brief account is given of the progress of *Macrocentrus ancylivorus* Roh. as a parasite of the oriental fruit moth following its introduction from New Jersey and liberation in western New York, commenced in 1928. Each year since 1929 the host individuals constituting the populations of the oriental fruit moth in Niagara County, N. Y., have become more widely separated by reason of the reduced population, and each year *M. ancylivorus* has been able to find and successfully attack a larger proportion of the host larvae.

Is wax a necessary constituent of the diet of wax moth larvae? M. H. Haydak (*Ann. Ent. Soc. Amer., 29 (1936), No. 4, pp. 581–588*).—An experiment conducted at the Minnesota Experiment Station indicates that wax is not an essential constituent of the food of the wax moth larvae, since they were successfully reared to the adult stage for two generations on a number of media which did not contain even traces of wax. "A deficiency in the development of the wax moth was observed on a food consisting of powdered dried yeast mixed with sawdust. The best development of wax moth larvae was achieved on foods having liberal supply of all the essential food constituents as applied to rats. A formula of an adequate food for rearing of wax moth larvae is given."

Winter mortality of larvae of the European pine shoot moth (Rhyacionia buoliana Schiff.) in Connecticut, A. S. West, Jr. (*Ann. Ent. Soc. Amer., 29 (1936), No. 3, pp. 438–448, figs. 3*).—Observations of the effect of winter temperatures on the survival of the European pine-shoot moth during the severe winter of 1933–34 as contrasted with the preceding two winters, together with the results of some laboratory experiments on lethal low temperatures, are reported.

Sugar-cane varieties in Antigua in relation to (a) infestation, (b) field losses by the moth borer (Diatraea saccharalis Fabr.), L. L. de Verteuil (*Trop. Agr. [Trinidad], 13 (1936), No. 5, pp. 130–135, figs. 2*).—A description is given of various types of injury to sugarcane by the sugarcane borer, and previous investigational work in connection with the differences in varietal susceptibility to borer is referred to. Two variety tests were conducted with reference to infestation and percentage loss in weight by the moth borer, the results showing that the percentage loss in weight is not necessarily proportionate to the percentage joint infestation and that there is a significant difference between varieties when compared on measurable field losses (percentage loss in weight).

The incidence of the large moth borer Castnia licus in wild plants in Trinidad, D. Vesey-FitzGerald (*Trop. Agr. [Trinidad], 13 (1936), No. 2, p. 37*).—Observations made during an unsuccessful search for a parasite of *C. licus* in Trinidad at the end of 1933 and early in 1934 have shown this moth to be attached to plants belonging to unstable communities under conditions of

only moderate shade, although extending into more stable plant associations in the absence of shade.

The effectiveness of cultivation as a control for the corn earworm, G. W. BARBER and F. F. DICKE (*U. S. Dept. Agr., Tech. Bul. 561 (1937), pp. 16, figs. 2*).—Experiments with simulated and actual plowing of three types of soil at Charlottesville, Va., and one type of soil at Savannah, Ga., during the period 1928–33, for the purpose of determining their effect on the control of the corn earworm, are reported.

"Piedmont red clay, sandy loam, and an artificially made high-humus-content soil were used at Charlottesville, and a fine sand soil was used at Savannah. Cages containing these soils were fall plowed and spaded, spring plowed and spaded, and fall disked, respectively; control cages in which the soil was uncultivated accompanied each series of treated soils.

"It was found that each kind of treatment was an important factor in reducing the number of moths of the corn earworm emerging from hibernation. Fall plowing reduced moth emergence most, fall disking least, and the effectiveness of spring plowing lay between these two treatments. Each operation is a material aid in the control of the insect and can be employed where its practice meets cultural and economic conditions to best advantage. The high-humus-content soil (a mixture of cow manure, sandy loam, and red clay) appeared to be very favorable to the development of the parasitic fungus *Sorosporella uvella*, which killed the pupae, so that during a 5-yr. period in which experiments were carried on no moths emerged from hibernation from this soil."

Digestive enzymes in the southern armyworm, F. H. BABERS and P. A. WOKE (*Jour. Agr. Res. [U. S.], 54 (1937), No. 7, pp. 547–550*).—With a view to determining the enzymes normally present in the digestive tract, a series of qualitative tests were made, using the southern armyworm reared on foliage of turnip and cabbage plants. The tests were made on extracts of the contents and tissues of the foregut, midgut, and hindgut, on regurgitated material, and on extracts of the labial glands. "The approximate H-ion concentration of the contents of each part of the digestive tract was determined colorimetrically. The contents of the foregut had a pH between 7.6 and 8.0, those of the midgut had a pH of 8.2 in the fore part and 7.7 in the rear portion, and those of the hindgut and the excreta a pH between 7.4 and 7.6. Amylase, maltase, glycogenase, invertase, rennin, lipase, trypsin, and erepsin were found. The location of these enzymes in the various sections of the gut is given. The presence of raffinase is doubtful, and tests for the presence of lactase, cellulase, emulsin, and pepsin were negative."

Control of larvae of diamondback moth (Plutella maculipennis Curtis), H. G. WALKER and L. D. ANDERSON (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 443–448, fig. 1*).—Experiments conducted by the Virginia Truck Experiment Station (E. S. R., 73, p. 508) led to the dusting of kale plants infested with newly hatched larvae of the diamondback moth on October 31 and November 10 at the rate of about 25 lb. per acre "with derris-talc and cube-talc dusts containing 0.5 percent rotenone, both in combination with and without Aresket. The derris-talc, derris-Aresket-talc, and cube-talc dusts gave 82 percent control and the cube-Aresket-talc dust gave 87 percent control, indicating that there is very little difference between the effect of any of the dusts, and that, if applied when the larvae of the diamondback moth are young, either a derris-talc or a cube-talc dust containing approximately 0.5 percent rotenone and 2 percent total extractives will give satisfactory control of this insect."

The life cycle of laboratory-bred Anopheles albimanus Wiedemann, L. E. ROZEBOOM (*Ann. Ent. Soc. Amer., 29 (1936), No. 3, pp. 480–489, fig. 1*).—

A study of the life cycle of *A. albimanus*, an important carrier of malaria in Panama, is reported upon.

Variations of seasonal cycle in the genus Tabanus, H. H. SCHWARDT (*Ann. Ent. Soc. Amer., 29 (1936), No. 4, pp. 589–592*).—The observations here reported, which supplement earlier studies at the Arkansas Experiment Station (E. S. R., 76, p. 221), have shown "that *T. lineola* and *T. atratus* can develop from egg to adult during one summer, though the latter usually requires a year. *T. sulcifrons*, *T. costalis*, *T. lasiophthalmus*, *T. benedictus*, and *T. trimaculatus* all require approximately a year for development. *T. stygius* usually requires approximately 2 yr. for development, but certain individuals emerge after spending only 1 yr. in the immature stages. Rarely an individual of *T. atratus* will hibernate two winters before producing the adult."

Pangoniinae of Utah (Tabanidae: Diptera), J. A. ROWE and G. F. KNOWLTON (*Ohio Jour. Sci., 36 (1936), No. 5, pp. 253–259, figs. 14*).—This contribution from the Utah Experiment Station lists 15 species of pangoniid horseflies as occurring in that State, of which one is described as new under the name *Chrysops dilatus*.

The biology of Leschenaultia exul Townsend, a tachinid parasite of Malacosoma americana Fabricius and Malacosoma disstria Hubner, H. A. BESS (*Ann. Ent. Soc. Amer., 29 (1936), No. 4, pp. 593–613, figs. 24*).—Biological investigations of *L. exul*, a common leaf-ovipositing tachinid parasite of the eastern tent caterpillar and the forest tent caterpillar in the northeastern part of the United States, conducted at the Gypsy Moth Laboratory, Melrose Highlands, Mass., during the years 1933, 1934, and 1935, are reported. Having but a single generation a year in New England, it overwinters in the soil as pupae within the puparia. "The adult flies emerge in the latter part of April and the first part of May, and deposit their eggs on the foliage of trees fed upon by their hosts. Eggs may remain viable for a period of 26 days after deposition. The reproductive capacity of a single female fly may be as high as 5,000 eggs. The eggs are ingested by a host larva feeding on the egg-infested foliage. Hatching of the eggs occurs within the alimentary tract, and the tiny maggots migrate within a short time to the salivary glands of the host. The first-instar maggots complete their development within the salivary glands and molt into second-instar maggots just prior to or after migration from the salivary glands. In the second instar an integumental funnel is developed and the maggot remains within this funnel until the larval development has been completed. The third-instar maggot then leaves the host larva or pupa and enters the soil where a puparium is formed. Approximately 13 days are required to complete the larval development. In the laboratory the puparia were formed in the upper 2 in. of the soil. The parasite usually reaches the pupal stage within the puparium before July 1, and the species remains in this state until the following April or May. Usually only one third-instar maggot of *L. exul* issues from an individual host larva or pupa.

"*L. exul* apparently competes with several species of dipterous and hymenopterous parasites. From a small number of *M. americana* larvae which were parasitized by *L. exul* and *Compsilura concinnata* at about the same date *C. concinnata* was successful more often than not when competing with *L. exul*."

A synopsis of the Nearctic species of Oscinella and Madiza, based on a study of the types (Diptera, Chloropidae), C. W. SABROSKY (*Ann. Ent. Soc. Amer., 29 (1936), No. 4, pp. 707–728*).—A synopsis of the blackflies of the genera Oscinella (formerly known as *Oscinis*, *Oscinosoma*, and *Botanobia*) and

Madiza (formerly *Siphonella*) is presented, which includes keys to the groups and species.

[Report of fruitfly investigations in west Africa], R. H. VAN ZWALUWENBURG (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *41* (*1937*), *No. 1*, *pp. 78–83*).—The results of observations made during the course of a trip of investigation in west Africa from November 9, 1935, to July 28, 1936, are reported, the principal sources of fruitflies found in the various regions being considered, including Sierra Leone, Nigeria, Cameroun (Cameroons), and Belgian Congo.

The food of tsetse-flies (Glossina swynnertoni and G. palpalis) as determined by the precipitin test, C. B. SYMES and J. P. MCMAHON (*Bul. Ent. Res.*, *28* (*1937*), *No. 1*, *pp. 31–42*).—The application of the precipitin test in determining the main food hosts of *G. swynnertoni* and *G. palpalis* is reported upon, the details being given in tables.

Summary of laboratory studies of* Anomala, *1933–1935, R. H. VAN ZWALUWENBURG (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *41* (*1937*), *No. 1*, *pp. 25–32*, *fig. 1*).—Studies of the Asiatic beetle, first recognized as a cane pest on certain areas in the Pearl Harbor district of Oahu and serious outbreaks of which were renewed in 1930 after several years of apparent control by natural agencies, are reported under the headings of *Anomala* coefficient, soil moisture, effect of humidity differences upon the incubation of eggs, life history, and miscellaneous observations.

Observations on the morphology and bionomics of Serica brunnea L., *with notes on allied chafer pests.—I, The morphology of the larva of* Serica brunnea L., W. F. JEPSON (*Bul. Ent. Res.*, *28* (*1937*), *No. 1*, *pp. 149–165*, *figs. 8*).—This contribution relates to one of the worst pests of forest nurseries in Great Britain, its status having been discovered by J. W. Munro in 1927 (E. S. R., 59, p. 561).

Relation of gregarines to growth and longevity in the mealworm, Tenebrio molitor L., R. SUMNER (*Ann. Ent. Soc. Amer.*, *29* (*1936*), *No. 4*, *pp. 645–648*, *fig. 1*).—In a study of the relation of gregarines to growth and longevity in the yellow mealworm conducted at Boulder, Colo., a total of 100 larvae and 20 adults was employed. Since the mealworms that contained gregarines grew more rapidly and had a lower mortality rate than the gregarine-free larvae, it is concluded that gregarine infestation is essential to normal growth and longevity in the mealworm. The gregarine infesting the mealworm was identified as *Gregarina steini* Berndt. Thyroid retarded growth more markedly in the noninfested than in the infested larvae and accentuated the mortality rate.

Effects of subzero temperatures on populations of western pine beetle Dendroctonus brevicomis Lec., F. P. KEEN and R. L. FURNISS (*Jour. Econ. Ent.*, *30* (*1937*), *No. 3*, *pp. 482–504*, *figs. 5*).—The habits of the western pine beetle, normal mortality, immediate effects of low temperature, modifying factors, subsequent effect of winter killing, subsequent reinfestation, effects upon predatory insects, and control considerations are presented in this contribution, the details of which are given in tables and charts. It was found in general that cold weather affects the insect enemies of the western pine beetle to about the same degree as the host.

Dusting to control strawberry weevil in Virginia, L. D. ANDERSON and H. G. WALKER (*Jour. Econ. Ent.*, *30* (*1937*), *No. 3*, *pp. 437*, *438*).—Control work by the Virginia Truck Experiment Station with the strawberry weevil, which especially during the past 3 yr. has been a serious pest of strawberries on the Eastern Shore of Virginia, is reported upon. Some of the fields observed

in the northern part of Accomac County are said to have had as high as 75 percent of the buds cut by the ovipositing weevils. Dusted plats were found to produce yield increases from 35 to 62 percent over untreated plats and to have but from 7 to 15 percent of the buds cut as compared with 39 percent of buds on the untreated plats. While the plats treated with sulfur-calcium arsenate dust had the least number of buds cut, they did not yield as well as the other treated plats because this material caused marked foliage injury. The sulfur-lead arsenate, lime-lead arsenate, and sulfur-derris dusts gave about the same weevil protection, but for some unknown reason the sulfur-derris treated plats fell slightly below the other two in yield. Heavy frosts and freezes on April 24 and 25 and later droughts reduced the yields about 80 percent below normal in all plats.

Since the common red spider is frequently a serious pest in this area, the sulfur-lead arsenate dust is preferred to the hydrated lime-lead arsenate dust because it gives protection against this pest. The sulfur-derris dust may be used to eliminate the danger of an arsenical residue in fields where early berries have set at the time of treatment.

Testing for resistance to American foulbrood in honeybees, O. W. Park (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 504–512, figs. 13*).—In summarizing work conducted at the Iowa Experiment Station (E. S. R., 77, p. 373), the results of the inoculation of 31 colonies are considered. "American foulbrood became well established in all 6 of the check colonies and in several of those supposed to be resistant. Of 25 supposedly resistant colonies tested, 7 were found apparently free from disease on September 28. Of these 7, all but 1 are known to have developed more or less American foulbrood following inoculation."

***Some effects of temperature on the development and oviposition of* Microbracon hebetor (Say),** F. H. Harries (*Ohio Jour. Sci., 37 (1937), No. 3, pp. 165–171, figs. 2*).—The approximate duration of the developmental stages of *M. hebetor* as a parasite of the Mediterranean flour moth has been determined at constant temperatures for the range of from 16° to 32° C. "The egg and nymphal periods combined require about one-third and the pupal period about two-thirds of the total preimaginal period. The data on development conform well to the thermal constant theory between 20° and 32°. Mean oviposition rates do not indicate a thermal constant but show a sigmoid relationship which shows only a slight difference in the rate of egg laying between 28° and 32°. The thermal constant for development has a value of 154 day-degrees, and the temperature characteristic for oviposition between 16° and 26° has a least squares value of 21,400."

Coccid-inhabiting parasites from Africa with descriptions of new Encyrtidae and Aphelinidae, H. Compere (*Bul. Ent. Res., 28 1937), No. 1, pp. 43–51, figs. 3*).—This contribution from the California Citrus Experiment Station reports upon the classification of coccid-inhabiting parasites, obtained by the New South Wales Department of Agriculture, in Kenya and Uganda from August to October 1935. The forms considered represent seven genera, one of which, *Bothriophryne*, is erected, and seven species, of which five are described as new.

Improved control of red spider on greenhouse crops with sulfur and cyclohexylamine derivatives, C. C. Compton and C. W. Kearns (*Jour. Econ. Ent., 30 (1937), No. 3, pp. 512–522*).—Studies of the toxicity of various compounds to the common red spider, infesting a number of greenhouse crops under laboratory, field, and greenhouse conditions, are reported.

"Great variations in the susceptibility of red spiders to certain sprays have been shown to be closely correlated with the species of plant infested. The

materials tested were Selocide (8 percent potassium-ammonium-seleno-sulfide), ammonium polysulfide, two organic thiocyanates (Lethane 440 and Loro), and a derivative of cyclohexylamine produced by the Monsanto Chemical Company, known as C. P. 100. All of these materials were found to be effective and safe when applied to certain plants. Rose proved to be the most difficult plant on which to obtain a satisfactory control of red spider without causing injury to the plant. Selocide and C. P. 100 have been the most successful in the control of red spiders infesting roses in the greenhouse. The use of karaya gum as an agent to increase the toxicity of red spider sprays has been found to be highly efficient in this respect."

Three possible mite vectors of the Dutch elm disease, A. P. Jacot (*Ann. Ent. Soc. Amer., 29 (1936), No. 4, pp. 627–635, figs. 13*).—*Moniezielia arborea*, *Histiogaster fungivorax*, and *Megninietta ulmi*, the latter representing a new genus, all collected in elm bark in lower Westchester County, N. Y., are described as new to science.

Two spinning mites attacking the incense cedar in California, E. A. McGregor (*Ann. Ent. Soc. Amer., 29 (1936), No. 4, pp. 770–775, pls. 2, fig. 1*).—*Paratetranychus alpinus* and *Tetranychus libocedri*, which attack the incense cedar (*Libocedrus decurrens*) in Tulare County, Calif., are described as new to science. "It is not known which is the more serious, but together these two spinning mites are capable of considerable russeting and dropping of foliage of this magnificent Sierra conifer."

The anaerobic glycogen consumption in Ascaris females and males, T. v. Brand (*Jour. Parasitol., 23 (1937), No. 1, pp. 68–72*).—The glycogen content of the female of *Ascaris lumbricoides* from the pig was found to be a little lower than that of the male. The glycogen consumption is identical in both sexes during the first 24 hr. of starvation, but later on it decreases more rapidly in the female. This consumption appears to be much more independent of the glycogen content of the body than in free-living organisms.

A quantitative study of egg production in Taenia saginata, M. M. Schapiro (*Jour. Parasitol., 23 (1937), No. 1, pp. 104, 105*).—The results of counts made of the ova in four gravid segments from four different specimens of *T. saginata* are reported.

Fasciola gigantica, a liver fluke of cattle in Hawaii, and the snail, Fossaria ollula, its important intermediate host, J. E. Alicata and L. E. Swanson (*Jour. Parasitol., 23 (1937), No. 1, pp. 106, 107, fig. 1*).—Contributing from the Hawaii Experiment Station, the authors record the snail *F. ollula* as the important intermediate host of *F. gigantica*, the common liver fluke of cattle in Hawaii.

ANIMAL PRODUCTION

[Livestock investigations by the Wisconsin Station] (*Wisconsin Sta. Bul. 438 (1937), pp. 50, 51, 53–61, 129, 130, figs. 3*).—Progress reports of animal nutrition and feeding investigations (E. S. R., 75, p. 530) include the value of cheese meal and various types of soybean oil meals as protein supplements in pig rations, by G. Bohstedt and J. M. Fargo; the necessity of fat as a supplement to a skim milk diet, by E. J. Schantz, C. A. Elvehjem, and E. B. Hart; and the discovery of a new essential dietary factor belonging to the vitamin B complex, by Elvehjem, C. J. Koehn, and J. J. Oleson. Poultry investigations yielded information on the value of alfalfa meal in winter laying rations, liver meal as a substitute for dried milk in chick rations, the vitamin D requirements of laying pullets, and productive longevity in chickens as an inherited trait, all by J. G. Halpin and C. E. Holmes; the nutritional balance

necessary to prevent slipped tendon in chicks, by L. E. Clifcorn, Elvehjem, Hart, A. C. Wiese, and Holmes; the value of soybean oil meal for poultry, by H. J. Doebald, Halpin, and Holmes; and the relative efficiency of oats, wheat, and corn for prevention of gizzard lesions in chicks, by Halpin, Holmes, H. R. Bird, Oleson, Elvehjem, and Hart.

Efficiency of horses, men, and motors, S. Brody and E. A. Trowbridge (*Missouri Sta. Bul. 383 (1937), pp. 24, figs. 7*).—This is a popular presentation of the results of research previously noted (E. S. R., 76, p. 370).

The chemical composition and nutritive value of certain cereal hays as affected by plant maturity, J. Sotola (*Jour. Agr. Res. [U. S.], 54 (1937), No. 6, pp. 399–415*).—This contribution from the Washington Experiment Station presents data on the chemical composition of the dry matter of a number of cereal and legume plants in relation to stages of maturity and the weight relationship of leaves, stems, and heads; the chemical composition of whole plants, leaves, stems, and heads; the coefficient of apparent digestibility (as determined with lambs); and the relative palatability of Albit wheat, Pacific Bluestem wheat, Markton oats, and Horsford barley hays harvested at different stages of maturity.

In the young stages, the composition of the dry matter of the cereals was found to be practically identical with that of alfalfa and sweetclover, with the exception of calcium and phosphorus. As cereals approached maturity the stem-leaf-head ratio was shown to be a fairly reliable index of their nutritive value. There was a close association of crude fiber with stems; of total ash and calcium with leaves; and of phosphorus, crude protein, and nitrogen-free extract with heads. Based on the total digestible nutritive content of the various hays as determined by digestion trials and taking dough-stage Albit wheat as 100 percent, comparative ratings of 119.1, 116.8, 108.8, 105.7, 98.4, and 95.5 were indicated for ripe Horsford barley, medium-dough Horsford, medium Markton oats, ripe Albit wheat, milk-stage Albit, and medium-dough Pacific Bluestem wheat hays, respectively. In general the medium-dough stage of kernel maturity was most desirable for hay from these cereals, any benefits from increased digestibility past this stage being offset by shattering of kernels, leaf loss, leaching, and general plant deterioration.

The calcium and phosphorus contents of important New Mexico range forages, W. E. Watkins (*New Mexico Sta. Bul. 246 (1937), pp. 75, figs. 8*).—The material used in this study includes samples of the important range forages collected in each county of the State at or near the end of the growth period (September and October) and other samples of these forages collected during February and March after they had been subjected to the wintering and weathering processes. Samples of 34 species of grasses and 22 species of browse plants have been analyzed. Data on the dry matter and the calcium and phosphorus content of the forages along with information on the type of country, character of soil, elevation, and precipitation are tabulated by counties. On the basis of these data State maps are presented indicating the general plant distribution and the areas in the State in which forage plants are markedly deficient in either calcium or phosphorus.

The effect of the ingestion of cottonseed oil before and after hydrogenation on the composition of the body fat of the rat, J. M. Spadola and N. R. Ellis (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 205–218*).—Continuing this line of investigation (E. S. R., 67, p. 61), four groups of six rats each were fed experimental rations over a 10-week period, at the end of which all rats were killed and the adipose tissue removed and analyzed for total fatty acids and the component fatty acids present. Group 1 (control) received an adequate

basal diet containing only a small amount of naturally contained fat, while the remaining groups received 8 percent of cottonseed oil in some form by replacement of an equal amount of dextrin. Group 2 received the nonhydrogenated oil, group 3 oil which was hydrogenated to reduce moderately the linoleic acid content, and group 4 oil which was hydrogenated for maximum reduction of this acid.

The normal acid components of the body fat were found to be myristic, palmitic, stearic, palmitoleic, and oleic acids. The ingestion of fats of varying degrees of unsaturation particularly affected the unsaturated acid fraction of the body fat, rats receiving cottonseed oil depositing more palmitic and stearic acids than those receiving partially hydrogenated cottonseed oil or the low fat diet. Ingestion of linoleic acid resulted in its deposition in the adipose tissue in amounts approximately proportional to the quantity ingested and accompanied by a decreased deposition of palmitoleic and oleic acids. The body fat of rats receiving either plain or hydrogenated cottonseed oil contained small amounts of arachidonic acid and a saturated acid of molecular weight higher than C_{18}. Isooleic acid in the ration was deposited in the body fat.

The digestibility of rations by cattle and sheep, E. B. Forbes, J. W. Bratzler, A. Black, and W. W. Braman (*Pennsylvania Sta. Bul. 339 (1937), pp. 30, figs. 12*).—This bulletin presents results of four series of digestion trials each with sheep and dairy cows. Rations for the four experimental periods for both sheep and cows consisted of machine-dried alfalfa and a concentrate mixture (1:1) air-dry basis in periods 1 and 2; period 3, machine-dried alfalfa and ground corn (1:2) dry-matter basis; and period 4, sun-dried alfalfa hay and ground corn (1:1) dry-matter basis. The plane of nutrition at which the sheep were fed was 1.03, 1.27, 1.41, and 1.16 percent maintenance, and for the cows 1.38, 2.72 (milking cows), 1.36, and 1.21 percent maintenance for periods 1 to 4, respectively. The experimental technics and the apparatus used for collecting excreta are fully described. Data are presented on the average digestibility of a corn meal-alfala hay (1:1) ration by steers fed at 6 different planes of nutrition (from 0.5 to 3 times maintenance), and comparisons were made with the digestibility of rations as determined for the above groups of sheep and cows.

With steers the digestibility of dry matter, organic matter, crude protein, carbon, and total energy-producing nutrients was highest at a maintenance level and was lower at half maintenance and at each level above maintenance. With cows the digestibility of the rations also diminished as the plane of nutrition was raised above maintenance. In general, sheep digested the rations more efficiently than the cows, except for crude fiber in periods 1, 2, and 4, where the rations contained a high proportion of roughage. In these instances crude fiber was more thoroughly digested by cows. It is concluded that the published average coefficients of feeding stuffs for ruminants, which in the main have been determined with sheep at low planes of nutrition, are several percent too high to apply to the full-fed milk cow.

Researches into sterility of cows in South Africa: The influence of (1) dry rations, (2) lack of exercise, and (3) lack of sunlight on reproduction in beef heifers and cows, J. Quinlan and L. L. Roux (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 6 (1936), No. 2, pp. 719–772, figs. 44*).—From over 6 yr. of observation it is concluded that a dry ration of corn, wheat bran, and teff hay for 9 mo. and in addition silage during the remaining 3 mo. of the year gave very satisfactory results as regards growth, age at which sexual maturity was attained, and reproduction in beef heifers and cows.

The restriction of sunlight and exercise was in no way detrimental to the health, growth, or vigor of the cows and heifers, did not delay the onset of maturity, and tended to shorten the length of the dioestrous cycle and also the length of the period between calving and the first subsequent oestrous. Such environment did increase the average number of services required per conception, but did not affect the average length of the gestation period nor the average weight of the calf produced in comparison with animals having access to unrestricted sunlight and exercise. High condition had no ill effect upon either general health or reproductive processes. An extensive bibliography and numerous photographs and individual case records are appended.

Returns per acre in cattle feeding, P. Gerlaugh and H. W. Rogers (*Ohio Sta. Bimo. Bul. 186 (1937), pp. 104, 105*).—This test was designed to compare the feeding value of a full feed of corn silage with a similar area of corn fed as corn-and-cob meal and bundle stover, with legume hay supplied in each ration in such amounts as the cattle would consume. Two lots of 16 yearling steers each and two lots of 16 steer calves each were used in the trial, one lot of yearlings and one lot of calves receiving each type of ration for 287 days. The average daily gains, total gains per lot, and market value of the cattle were very similar for the two types of rations. The feed cost per hundredweight of gain was somewhat in favor of the silage ration, and the amounts of gain on the cattle per acre of feed showed considerable advantage in favor of the use of silage.

Comparison of feeds for wintering steers in the northern Great Plains, W. H. Black and O. R. Mathews (*U. S. Dept. Agr., Tech. Bul. 565 (1937), pp. 10, figs. 2*).—In further studies on wintering steers at the Ardmore (S. Dak.) Field Station (E. S. R., 63, p. 761), experiments were conducted over five winter feeding periods using about 40 high-grade Hereford steers approximately 18 mo. of age in each trial. The rations fed included alfalfa hay 8 lb. and oat straw 4 lb. per steer daily for all five winters; corn silage 16 lb. and oat straw 4 lb. per steer daily during three winters; sorgo silage 13.3 lb. per steer daily during four winters; and wintering steers on the range with supplements of alfalfa hay, oat straw, sorgo silage, and cottonseed cake during two winters. The length of the winter feeding period ranged from 142 to 182 days.

The average gains per steer were 22, 13, 46, and 44 lb., and the average value of feed consumed per steer was \$8.11, \$9.96, \$7.89, and \$4.72 for the above respective rations. These data indicate that corn silage and oat straw was the most expensive and the least efficient ration tested, that sorgo silage was more efficient and also more economical than the alfalfa hay-oat straw ration, and that it was more economical to winter steers on the range with supplemental feeding when necessary than to carry them in the dry feed lot.

Comparison of feeds for fattening beef calves before and after weaning, W. H. Black and E. A. Trowbridge (*U. S. Dept. Agr., Tech. Bul. 564 (1937), pp. 12*).—Continuing these studies at the Sni-a-Bar Farms, Mo. (E. S. R., 70, p. 663), this series of experiments compared the following concentrate mixtures for feeding calves from the time they were old enough to eat such feeds until weaning time and for fattening them in dry lot: (1) Shelled corn and cottonseed cake 8:1; (2) ground corn and cottonseed cake 8:1; (3) shelled corn, cottonseed cake, and alfalfa-molasses feed 8:1:1; and (4) ground corn, cottonseed cake, and alfalfa-molasses feed 8:1:1. These tests were conducted in 1931–32 and 1932–33. High-grade Shorthorn calves were used in each trial. Suckling calves averaging 77 days of age at the beginning of the trials were creep fed for 140 days.

The average total gain per head was 320, 312, 298, and 307 lb. and the average feed consumed per 100 lb. of gain was 186.5, 240.6, 208.7, and 233.3 lb. on rations 1, 2, 3, and 4, respectively. The larger and more economical gains of the calves fed shelled corn and cottonseed cake more than offset the slightly higher valuation of the calves getting shelled corn, cottonseed cake, and alfalfa-molasses. Grinding the corn significantly increased the cost of gain.

After weaning, these four groups were fattened in dry lot for 193 days on the same respective rations plus alfalfa hay and sorgo silage. There were no significant differences in the total gains of the four lots during this period. Either grinding the corn or adding alfalfa-molasses improved the palatability of the rations. Less concentrates were consumed per head and per 100 lb. of gain by the calves fed corn and cottonseed cake than by those receiving alfalfa-molasses in addition. The practice of grinding the corn, adding the alfalfa-molasses, or both, was not justified in these trials.

Fattening steer calves.—II, Quantity of supplement, P. GERLAUGH (*Ohio Sta. Bimo. Bul. 186 (1937), pp. 107, 108*).—In this, the second trial of this series (E. S. R., 75, p. 240), the same feed ingredients and plan of feeding were used, but the calves were of lighter weight, averaging at the start slightly over 340 lb. The results substantiate previous findings that 0.8 lb. of mixed protein and mineral supplement per steer daily in addition to a corn silage and hay ration is not sufficient for satisfactory gains. This statement applies to the lot fed at this level throughout the trial and also to the lots fed at this level for the first and third 12-week period of the trial, respectively.

Adding supplement to corn for calves on bluegrass pasture, III, P. GERLAUGH (*Ohio Sta. Bimo. Bul. 186 (1937), pp. 108, 109*).—Reporting another trial in this series (E. S. R., 75, p. 240), two lots of home-grown Aberdeen-Angus steers and heifers averaging 528 and 526 lb. for lots 1 and 2, respectively, were grazed on good bluegrass pasture for 168 days. Lot 1 rceeived corn alone as a supplement and lot 2 received corn and cottonseed meal. The average daily gain per head was 1.55 and 1.87 lb. for lots 1 and 2, respectively, and the cost per hundredweight gain was somewhat in favor of the group receiving cottonseed meal.

Reducing the amount of corn and increasing the amount of legume hay in rations for fattening yearling steers, P. GERLAUGH and C. W. GAY (*Ohio Sta. Bimo. Bul. 186 (1937), pp. 105, 106*).—In this trial three lots of 12 yearling steers each were fed over a 266-day experimental period. Lot 1 received all the corn-and-cob meal and all the legume hay it would consume, lot 2 received three-fourths as much corn-and-cob meal, and lot 3 one-half as much corn-and-cob meal as lot 1, each receiving all the legume hay it would consume, and the steers in all three lots received a uniform allowance of 1.5 lb. of mixed protein and mineral supplement per head daily. The average daily gain per steer was 2.04, 1.88, and 1.65 lb., the feed cost per hundredweight of gain was $9.34, $9.36, and $9.74, and the market appraisal of cattle per hundredweight was $10, $9.75, and $9.25 for lots 1, 2, and 3, respectively. The final degree of finish of the cattle was very much in proportion to their daily gains.

Raising calves on wire floors, J. W. BARTLETT and H. H. TUCKER (*New Jersey Stas. Circ. 372 (1937), pp. 4, figs. 2*).—This circular discusses the advantages resulting from raising calves on raised wire-floored platforms, the most important of which are improved health, greater gains, and more rapid growth of the young calves and also material savings in labor and in bedding material. Instructions for constructing individual calf platforms 4 × 5 ft. in size and floored with ¾-in. mesh wire cloth are presented. The estimated cost for material is about $5.50 per frame.

Breeding and lambing rate: Length of gestation period of range ewes, D. W. Chittenden and A. H. Walker (*Natl. Wool Grower, 27 (1937), No. 3, pp. 24, 25*).—The Montana Experiment Station has analyzed the breeding and lambing records of 672 grade Rambouillet ewes bred to Hampshire rams and 800 bred to Rambouillet rams. During a 30-day mating season, 54.32 and 43.25 percent of the ewes mated to Hampshire and Rambouillet rams, respectively, were bred during the first week, 33.78 and 34.88 percent during the second week, and 11.9 and 21.88 percent during the last half of the period. Lambing extended over a 35-day period, with 29.61 and 25 percent of the ewes bred to Hampshire and Rambouillet rams, respectively, lambing during the first week, 42.41 and 40.88 percent during the second week, 22.47 and 24.5 during the third week, and 5.52 and 9.62 percent during the last two weeks of the lambing season. The gestation period averaged 148.61 days for ewes bred to Hampshire rams and 150.51 days for those bred to Rambouillet rams, indicating that the breed of the ram has some influence on the length of the gestation period.

Further observations on the milk of the Merino ewe, A. W. Peirce (*Austral. Jour. Expt. Biol. and Med. Sci., 14 (1936), No. 3, pp. 187–192*).—Data are presented on the average composition of colostrum from Merino ewes and on the average yield and composition of milk from similar ewes at 2, 3, 4, 6, and 9 weeks after lambing, the data for the 3- and 9-week stages being reproduced from a previous report.[4]

Relative efficiency for growing lambs of the protein in rations supplemented by soybean-oil meal, linseed meal, or corn-gluten meal, J. I. Miller, F. B. Morrison, and L. A. Maynard (*Jour. Agr. Res.* [*U. S.*], *54 (1937), No. 6, pp. 437–448, fig. 1*).—The [New York] Cornell Experiment Station has conducted a series of nitrogen balance experiments to determine the digestibility and utilization of the proteins in rations in which soybean oil meal, linseed meal, and corn gluten meal were used as supplements to corn and timothy hay or corn and corn stover. In each trial eight wether lambs were employed, and the feeding of an experimental ration extended over a 10-day (or longer) adjustment period and a 10-day collection period. Timothy hay or corn stover made up 50 percent of the rations, and the proportions of corn and protein supplement were so adjusted that the entire ration contained approximately 10 percent of total protein.

In all trials the coefficients of apparent digestibility of the protein were very similar. The average percentage of total nitrogen stored was 21.2, 21.1, and 22.8 on the timothy rations and 17, 15.9, and 16.3 on the corn stover rations when soybean oil meal, linseed meal, and corn gluten meal, respectively, was the protein supplement. These results with growing lambs indicate that these three protein-rich feeds have approximately the same efficiency as supplements to a low protein basal ration of corn and timothy hay or corn and corn stover insofar as the utilization of the total protein in the ration is concerned.

Determination of the yield of raw wool from its density under pressure, R. H. Burns and A. Johnston (*Jour. Textile Inst., 28 (1937), No. 1, pp. T13–T20, figs. 2*).—This article from the Wyoming Experiment Station presents preliminary results indicating that it is possible to predict the actual yield of raw wool from its density under pressure within a comparatively small margin. The apparatus for making the compression test is described, and its value as a tool for the wool grower and buyer is discussed.

The poultry-keeper's text-book, E. T. Brown (*London and Melbourne: Ward, Lock & Co., 2. ed., pp. 320,* [*pls. 67*]).—A revision (E. S. R., 51, p. 176) of a practical book for the poultry keeper dealing with the origin and classification

[4] Austral. Jour. Expt. Biol. and Med. Sci., 12 (1934), No. 1, pp. 7–12.

of breeds, the theory of breeding and poultry keeping, and methods by which they may best be put into practice.

[Poultry investigations in New Jersey] (*New Jersey Stas. Rpt. 1936, pp. 15, 16, 18, 85, 86, 88, 89, 92, 93*).—The various investigations discussed include changing trends in egg production performance and mortality in egg-laying contests, the correlation between weight of eggs and weight of chicks at hatching, heavy hatching eggs as a means of flock improvement with regard to egg size, variations in eggshell color in a given strain of Rhode Island Reds, crossbreeding for poultry meat production, and a comparison of individual cages v. pen management of the breeding flock. Nutrition studies gave information reported on the vitamin A requirements of the laying hen and on the role of tryptophane in chick nutrition.

A criterion for testing the accuracy of trap-nest records, W. A. Hendricks (*Jour. Agr. Res. [U. S.], 54 (1937), No. 6, pp. 461–464*).—This contribution from the U. S. D. A. Bureau of Animal Industry points out a weakness of the existing methods of testing the accuracy of trap nest records in poultry record-of-performance work in that there is a lack of information regarding the amount of variability to be expected under normal conditions. A new test is proposed which is free from this defect and might be used to supplement those tests in present use. This test involves the calculation of a statistic which, under normal conditions, is distributed in the same manner as the well-known X^2 criterion of goodness of fit as applied to frequency distributions. The number of monthly inspections corresponds to the number of degrees of freedom which specifies the form of the latter distribution.

Use of artificial light for poultry, C. S. Platt (*New Jersey Stas. Hints to Poultrymen, 24 (1937), No. 4, pp. 4*).—The stimulating effect of light on egg production is discussed, and suggestions are offered as to when to use artificial light and how to feed the flock receiving it.

Growth and feed standards for New Hampshire, A. E. Tepper (*New Hampshire Sta. Circ. 52 (1937), pp. 8, fig. 1*).—This circular sets forth tentative standards for normal weight, growth, and feed consumption for the New Hampshire breed of chickens. A chart is presented for estimating the spread or margin of profit to be derived from birds sold for meat purposes based on varying meat prices and varying feeding costs.

Distillery slop in chick rations, W. M. Insko, Jr., G. D. Buckner, J. H. Martin, and A. Harms (*Kentucky Sta. Circ. 46 (1937), pp. 8*).—In a series of experiments in which distillery slop was fed at varying levels in a growing ration for chicks, thin distillery slop proved unsatisfactory as a supplement to an all-mash ration. Three separate trials were conducted in which thick distillery slop containing from 8.5 to 9 percent solids and prepared from mash which contained approximately three times as much corn as other grain replaced approximately one-half, four-fifths, and all of the corn in the chick-growing ration. The slop was fed ad libitum, in separate containers, except for one lot where the slop was mixed with the mash in the proportion of 1 part of mash to 2 parts of the slop. In all cases the ration containing the slop produced birds of greater average weight at 10 weeks of age than those on the all-mash ration. The amount of slop required to replace 1 lb. of mash varied considerably in the different trials, averaging about 16 lb. in the first and 24 lb. in the third trial. Cooking and flavor tests with broilers showed individuals from all lots to be exceptionally tender and of good flavor. Birds on the all-mash ration and those which received mash mixed with the slop had a higher percentage of fat than birds receiving the slop ad libitum.

Alfalfa leaf meal as a source of vitamin A for growing chickens, B. W. Heywang and H. W. Titus (*Jour. Agr. Res. [U. S.], 54 (1937), No. 8, pp. 559–*

569, figs. 3).—The first phase of this study by the U. S. D. A. Bureau of Animal Industry was directed toward devising a suitable vitamin A-deficient basal ration for chicks. Feeding trials established a ration consisting of white corn meal, wheat middlings, casein, pure dried yeast, ground limestone, steamed bonemeal, viosterol solution, and salt 64:15:10:4:3:1:2:1 as satisfactory for studying the vitamin A potency of various alfalfa products. In the second phase of the study feeding trials compared the vitamin A potency of Arizona, California, and Colorado sun-cured alfalfa leaf meals, California alfalfa powder, and California and Oklahoma dehydrated alfalfa leaf meal. Positive control rations variously contained fresh alfalfa, cod-liver oil, or fresh carrots, and the unsupplemented new basal diet served as the negative control.

It is concluded that the vitamin A potency of alfalfa leaf meals varied greatly, with about as much variation occurring between different samples of a given type as among the different types studied. As little as 1.5 percent of the best alfalfa meals in the ration supplied adequate amounts of vitamin A for good viability and growth, but it is recommended that not less than 5 percent of alfalfa meal of unknown potency be used in the chick growing ration. Evidence obtained indicated an increase in the vitamin A requirements per unit of feed with increasing age of the chicks.

The relation of the carotenoid pigments of feed to the carotenoid pigments of egg yolk, J. S. Hughes and L. F. Payne (*Poultry Sci., 16 (1937), No. 2, pp. 135–138*).—The Kansas Experiment Station has studied the relation between the amounts of the alcoholic phasic fraction (xanthophylls) and the petroleum phasic fraction (carotene and cryptoxanthin) of the carotenoid pigments in yellow corn, green barley, and dehydrated alfalfa in the ration of laying hens and the percentage recovery of these pigment fractions in the egg yolks. When hens were fed 10, 20, 30, and 40 g of yellow corn daily, 17.4, 21.4, 23.5, and 25.7 percent of xanthophyll fraction and 12, 6.4, 4.8, and 7 percent of the carotene fraction, respectively, were deposited in the egg yolk, although in the case of the latter the percentage deposited varied widely with different individuals. When yellow corn, green barley, and dehydrated alfalfa were fed at such levels as to supply approximately 1 mg of the xanthophyll fraction daily, 25.7, 15.8, and 15.7 percent of the pigment from these respective sources was deposited in the yolks, but only 2.6 and 2.5 percent of the carotene from green barley and dehydrated alfalfa, respectively, was so deposited.

Vitamin D requirements of growing chicks as affected by the calcium content of the ration, J. R. Couch, G. S. Fraps, and R. M. Sherwood (*Poultry Sci., 16 (1937), No. 2, pp. 106–108*).—Chick-feeding tests at the Texas Experiment Station in which the calcium content of the rations varied from 1.31 to 1.71 percent and the vitamin D potency from 1.1 to 3.6 international units per 100 g of ration showed that with suitable percentages of calcium and phosphorus the vitamin D required depends on the quantity of calcium present. With rations containing from 1.51 to 1.71 percent of calcium, 3.6 international units of vitamin D per 100 g of ration proved adequate for the first 12 weeks of growth and normal calcification of the bones of chicks kept in the absence of sunlight.

Comparison of cod-liver oil and ultraviolet irradiation as sources of vitamin D for confined laying hens, R. B. Nestler (*Jour. Agr. Res. [U. S.], 54 (1937), No. 8, pp. 571–582, figs. 6*).—The U. S. D. A. Bureau of Animal Industry has obtained data on three groups of Rhode Island Red hens over a 2-yr. period. These lots were constantly confined without access to sunlight, one group receiving 2 percent of cod-liver oil as a supplement to the basal diet, a second group receiving 15 minutes' irradiation daily with a carbon arc lamp,

and the third group receiving no vitamin D supplement. The basal diet contained 7.9 percent of ash, 3.2 percent of calcium, and 0.8 percent of phosphorus during the first year, and 11.7 percent of ash, 2.1 percent of calcium, and 1 percent of phosphorus during the second year, but otherwise was constant throughout the trial. The results are presented in tabular and graphic form.

Cod-liver oil gave better results in egg production, live weight, total weight of eggs per hen, weight of eggshells, and hatchability of fertile eggs than resulted from the ultraviolet irradition, with both supplements giving markedly better results than the unsupplemented ration inadequate in vitamin D. More feed was consumed per hen but less per dozen eggs produced by hens receiving cod-liver oil than by the irradiated lot. The percentage of ash and calcium in the eggshell was similar on the two suplemented rations, but the percentage of phosphorus in the eggshells was less for the cod-liver oil group than either of the other two lots.

Relationship between yolk index, percentage of firm white, and albumen index, V. Heiman and L. A. Wilhelm (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 7, pp. 551–557, fig. 1*).—The Washington Experiment Station has determined the observed grade, albumin index, yolk index, and percentage of firm white on 100 freshly laid eggs and on three other similar lots of eggs subjected to 4, 8, and 12 days' storage, respectively, at 80° F. and a wet bulb reading of 78°. Average values for the various egg quality measurements for each of the four lots of eggs are presented, and correlation coefficients were determined between observed grade and each of the other three measurements for each lot separately and for the entire lot of 400 eggs. Yolk index, percentage of firm white, and albumin index each showed changes upon storage which were due to deterioration in interior egg quality. The albumin index showed a high correlation with observed grade of eggs at each step, whereas yolk index and percentage of firm white showed little, if any, relation to observed grade or to each other in the fresh eggs or in the eggs which had undergone the same degree of deterioration.

Constituents of wheat gray shorts which prevent slipped tendons, R. M. Sherwood and G. S. Fraps (*Poultry Sci., 16* (*1937*), *No. 2, pp. 109–111*).—In a series of chick-feeding trials at the Texas Experiment Station, the high degree of incidence of slipped tendons on a basal ration was not materially altered by replacing 20 percent of ground kafir in the basal ration with either the ethylene dichloride extract or the alcoholic extract of an equivalent weight of wheat gray shorts. However, replacing the kafir with an equivalent weight of shorts, the ash of that amount of shorts, or the residue from the extraction of shorts with either the ethylene dichloride or alcohol resulted in a very low slipped tendon index, indicating that the factor in gray shorts which prevents slipped tendon is not an organic substance, but is one or more of the mineral constituents of the ash.

Serum phosphatase in the domestic fowl, R. H. Common (*Jour. Agr. Sci.* [*England*], *25* (*1936*), *No. 3, pp. 492–508, figs. 4*).—The serum phosphatase activity has been studied in (1) normal birds from hatching to maturity, (2) laying birds receiving vitamin D supplement in the ration, (3) laying birds receiving high and low calcium rations, and (4) rachitic chicks.

Normal laying hens and hens in a period of suspended egg production were found to have a higher and more variable serum phosphatase value than cocks, while pullets which had never laid showed values similar to those for cocks. Serum phosphatase in chicks rapidly increased to a maximum at from 10 to 12 days after hatching followed by a rapid decline to 3 weeks of age, beyond which there was a gradual decline until maturity in cocks and a similar

decline in pullets until the onset of laying. Administration of vitamin D concentrate did not reduce the range of variation of serum phosphatase in laying birds. The increase in phophatase was much greater during laying for pullets receiving low calcium than for those on a high calcium intake level. Phosphatase values were greatly increased in rachitic chicks.

Fluctuations of calcium and inorganic phosphorus in the blood of the laying hen during the cycle of one egg, J. G. Feinberg, J. S. Hughes, and H. M. Scott (*Poultry Sci., 16 (1937), No. 2, pp. 132–134*).—This is a report from the Kansas Experiment Station. The analysis of the blood serum of laying and nonlaying hens showed that the calcium level in each was relatively constant during the 26-hr. period of a single egg cycle. Analysis for inorganic phosphorus during a similar period revealed a marked rise in the blood phosphorus level of laying hens during the period of shell formation, while the phosphorus level in nonlaying hens was relatively constant throughout the period.

Effect of the calcium and phosphorus content of the diet of chickens on egg production and hatchability, H. W. Titus, T. C. Byerly, N. R. Ellis, and R. B. Nestler (*Poultry Sci., 16 (1937), No. 2, pp. 118–128*).—This contribution from the U. S. D. A. Beltsville Research Center reports three experiments in which diets containing different percentages of calcium and phosphorus were fed to laying pullets and yearling hens. In experiment No. 1 with pullets and experiment No. 2 with hens a constant phosphorus level of 1.2 percent was maintained, while calcium levels of 1.2, 3, and 5.4 percent were supplied both as calcium carbonate and as calcium sulfate. In experiment No. 3, including both hens and pullets, calcium levels of 1.2, 3, and 5.4 percent were fed at a phosphorus level of 1.2, while 0.9-, 2.25-, and 4.05-percent levels of calcium were fed at a phosphorus level of 0.9 percent, calcium carbonate being used as a supplement in all cases.

In the lowest levels of calcium intake the hens yielded more eggs than the pullets, but at the highest levels the pullets laid more eggs than the hens. In general, high calcium intake adversely affected the hatchability of eggs and increased embryonic mortality during the last 3 days of incubation, particularly in the case of hens' eggs. Calcium carbonate and calcium sulfate were equally satisfactory for egg production, but better hatchability resulted from use of the former. The level of phosphorus intake did not significantly affect either egg production or hatchability. The adverse effect of high calcium intake was more pronounced at the 0.9-percent phosphorus level than at the 1.2-percent level. A method is suggested for estimating the calcium required in the diet based on the phosphorus content of the diet, the feed consumption, and the potential egg-laying capacity of the chickens.

Hatchability as related to seasons and hour of laying, F. A. Hays (*Poultry Sci., 16 (1937), No. 2, pp. 85–89, figs. 9*).—The Massachusetts Experiment Station analyzed hatching records covering 20 yr. (1916–35) with the object of determining the relation of season to hatchability of fertile eggs and the possible relationship between the hour of laying and fertility of eggs, early embryonic death rate, late embryonic death rate, and the percentage of fertile eggs that hatch from hens and from pullets.

Eggs from hens gave a rather marked improvement in hatchability as the season advanced, while pullet eggs showed no change after the first two hatches. There was an increase in the proportion of eggs laid in the forenoon with advance in season, the proportion at all times being essentially the same for hens and pullets. Hour of laying was shown to have little or no effect on the above-named conditions.

A comparison of the glycine contents of the proteins of normal and chondrodystrophic chick embryos at different stages of development, A. R. Patton (*Jour. Nutr., 13 (1937), No. 2, pp. 123–126*).—This report from the [New York] Cornell Experiment Station is an extension and substantiation of work previously noted (E. S. R., 75, p. 680). Definite evidence was obtained that glycine is synthesized during the development of White Leghorn and Barred Plymouth Rock chick embryos. Chicks that died of chondrodystrophy during development contained less than normal amounts of glycine, although the relation between chondrodystrophy and the low value for glycine has not been established.

Effect of incubation temperature on time of death of chick embryo and relationship of energy metabolism to mortality, E. M. Pringle and H. G. Barott (*Jour. Agr. Res. [U. S.], 54 (1937), No. 6, pp. 465–468, fig. 1*).—In this study, reported by the U. S. D. A. Bureau of Animal Industry, a total of 878 fertile eggs were incubated at 102° F. and 791 fertile eggs at 99°. The incubation was carried out in a respiration calorimeter, and all conditions were carefully controlled with relative humidity at 60–70 percent, oxygen at 21 percent, and carbon dioxide below 0.5 percent.

The results indicate that there are two critical periods of mortality at incubation temperatures of either 99° or 102°, during which approximately two-thirds of all mortality occurs. The first peak of mortality was reached on the third day of incubation at either temperature; the second period occurred shortly before the normal hatching time, the peak of mortality occurring on the nineteenth day at 102° and on the twentieth day at 99°. At both temperatures this peak in mortality occurred immediately after a sharp break in the heat elimination curve. A comparison of the energy metabolism and mortality curves of the growing embryo indicates an association between rate of change in energy metabolism and mortality.

Sexing day-old chicks, T. Murari (*Agr. and Livestock in India, 6 (1936), No. 1, pp. 63–65, pl. 1, figs. 2*).—*A description of the method of determining the sex of* day-old chicks.

Light in relation to the experimental modification of the breeding season of turkeys, H. M. Scott and L. F. Payne (*Poultry Sci., 16 (1937), No. 2, pp. 90–96, figs. 2*).—In a study at the Kansas Experiment Station, three lots of Narragansett female turkeys hatched in May were placed on experiment December 1. Lot 1 housed in an open-front poultry house received artificial lighting from 4:30 a. m. until daylight from December 1 to February 1 and in decreasing amounts until April 1, lot 2 was similarly housed without artificial lighting, and lot 3 remained in the open throughout the winter and breeding season.

The artificial lighting modified the reproductive cycle of the turkey, lot 1 starting to lay in January whereas the other lots produced no eggs until early March. There was little difference in the response of lots 2 and 3, indicating that proper housing exerted no influence on the sex cycle of the turkey. Subsequent trials showed that exposure to either white light or the longer wave lengths of red light stimulated early sexual activity, while the shorter wave lengths of blue light failed to exert such effect. The early ovarian activity is attributed to the increased light ration rather than to the lengthening of the feeding day. Four hours' artificial lighting during the normal period of daylight were without effect.

Dressing shrinkages of Bronze turkeys, S. J. Marsden (*Poultry Sci., 16 (1937), No. 2, pp. 112–117*).—Tests at the U. S. Range Livestock Experiment Station at Miles City, Mont., indicate that the weight losses of Bronze turkeys

during overnight fasting averaged 3.34 percent of the live weight before fasting. The weight loss of young turkeys of both sexes and of all weights and grades during slaughtering, dry picking, and overnight air-chilling averaged 9.62 percent of the live weight after fasting. Little difference was noted between sexes, but large birds lost a smaller percentage than small birds and fat birds less than thin ones. Weight loss due to full drawing averaged 14.65 percent of the dressed and chilled weight in fat young toms and 15.39 percent in fat young hens. Weight loss due to killing, dry picking, chilling, and full drawing averaged 23.18 and 23.47 percent for young toms and young hens, respectively.

The dissection of a frequency distribution into two normal components, W. A. Hendricks (*Poultry Sci., 16 (1937), No. 2, pp. 129–131, fig. 1*).—This note from the U. S. D. A. Bureau of Animal Industry is a critique of an article by Hays (E. S. R., 75, p. 829).

DAIRY FARMING—DAIRYING

Proceedings [of the] twenty-first and twenty-second annual meetings, western division, American Dairy Science Association (*Amer. Dairy Sci. Assoc., West. Div., Proc. Ann. Meeting, 21 (1935), pp. [3]+95, fig. 1; 22 (1936), pp. [2]+84, figs. 8*).—The proceedings, in mimeographed form, of the twenty-first and twenty-second annual meetings held at Portland, Oreg., October 6, 1935, and October 5, 1936 (E. S. R., 72, p. 830), are presented.

[Experiments with dairy cattle and dairy products in Connecticut] (*[Connecticut] Storrs Sta. Bul. 214 (1937), pp. 14, 15, 19, 20*).—Brief reports are presented on the effects of silage, succulence, and water in the dairy herd ration and sources of oxidized or cardboard flavor in milk.

[Investigations with dairy cattle and dairy products] (*New Jersey Stas. Rpt. 1936, pp. 16, 17, 18, 42–46, 47*).—Dairy cattle studies reported include the effect of a fish meal-sea kelp preparation on the reproductive process in the dairy cow; methods of winter feeding dairy heifers and their relationship to subsequent growth on summer pasture; the minimum milk requirements for raising dairy heifers, the value of grass silage, animal byproducts, and dehydrated molasses in the dairy ration; the loss of nutrients in molasses silage; grass silage as a means of growing more feed units per farm; and the carrying capacity of fertilized pastures. Breeding studies gave information on the consequences of inbreeding and outcrossing Holstein cattle, and color pigmentation in the skin and milk of Guernsey cattle.

With dairy products studies information was obtained on the influence of fatty acids and their triglycerides on the processing of dairy products, and the effect of processing on the physical and chemical properties of milk and its products, with special reference to the relation of the individual cow to the development of off flavors.

[Investigations with dairy cattle and dairy products by the Wisconsin Station] (*Wisconsin Sta. Bul. 438 (1937), pp. 45, 46, 48–50, 51, 52, 131, 132, 149–158, figs. 2*).—The following studies with dairy cattle are discussed: The effectiveness of dry rations for raising dairy calves, by I. W. Rupel and G. Bohstedt; the relative merits of the A. I. V. process and molasses for preserving legume silages, by W. H. Peterson, E. B. Hart, C. A. Elvehjem, Bohstedt, and Rupel; and the effect of age at first calving on subsequent milk production of dairy cows, by A. B. Chapman and G. E. Dickerson.

Nutrition studies yielded further information (E. S. R., 75, p. 535) on the factors responsible for summer milk excelling winter milk in nutritive value, the value of the juice from A. I. V. and molasses silage for fortifying winter

milk, and the differences in the nutritive value of summer-canned and winter-canned evaporated milk, all by G. O. Kohler, Elvehjem, and Hart.

Dairy products studies reported include improved methods for producing Swiss cheese starter cultures, by W. C. Frazier and P. R. Elliker; methods for salting brick cheese, by E. L. Byers and W. V. Price; suitable wrappers for processed cheese and the absence of a need for calcium citrate, by H. L. Templeton and H. H. Sommer; the suitability of certain low-cost equipment for the pasteurization of milk in cheese factories, by Price and Z. D. Roundy; factors affecting the stability of butterfat toward oxidation, by V. C. Stebnitz and Sommer; and a study of milk film characteristics and their effect on the utilization of ultraviolet radiation, by H. H. Beck, K. G. Weckel, and H. C. Jackson.

Persistency of production in Jersey cows and its practical application, L. Copeland (*Jour. Dairy Sci., 20 (1937), No. 3, pp. 151–158, figs. 4*).—The author has compared the composite lactation curves of 20 class A Jersey records exceeding 1,000 lb. of butterfat with 30 class A 365-day and 30 class A 305-day records which failed to qualify for Register of Merit requirements. In the case of the high records the monthly milk or fat yield, after the maximum was passed, was approximately a constant percentage of the preceding month's production (range from 93.8 to 98.8 percent). With the low yields the percentage decline from month to month was also quite constant, although of a lower order than for the high yields until the last 2 mo. of lactation when the curve showed a sharper downward trend. Maximum yields of milk or butterfat gave little information regarding persistency, the cows with the same initial rate of yield varying greatly in persistency of production. Cows with a low total production reached a maximum rate earlier than cows with a high total production. Persistency appeared to be an inherited character. Heifers which, under normal conditions, failed to milk at least 8 or 9 mo. during their first lactation rarely developed into profitable producers during later lactations.

The value of artificially dried grass, silage made with added molasses, and A. I. V. fodder in the diet of the dairy cow and their effect on the quality of the milk, with special reference to the value of the non-protein nitrogen, S. J. Watson and W. S. Ferguson (*Jour. Agr. Sci. [England], 26 (1936), No. 3, pp. 337–367*).—Continuing this line of investigation (E. S. R., 76, p. 237), four lots of four cows each were fed over a 17-week continuous feeding trial. The rations included a control of roots, hay, and concentrates and experimental ones in which a considerable part of the concentrates were replaced by either artificially dried grass, molasses grass silage, or A. I. V. grass silage, the rations being so adjusted that each supplied equal amounts of starch equivalent and digestible crude protein for maintenance and milk production. The average composition and nutritive value of the various constituents of these rations are indicated.

A statistical analysis of milk and butterfat yields, butterfat percentage, and live weight changes showed no significant differences between the four rations. The value of the nonprotein nitrogen of the molasses and A. I. V. silages proved high at the levels fed, indicating that digestible crude protein is a better guide to the feeding value of the nitrogen of these feeds than either digestible true protein or protein equivalent values.

White fish meal for growth and milk production, C. F. Monroe, W. E. Krauss, and C. C. Hayden (*Ohio Sta. Bimo. Bul. 185 (1937), pp. 46–52, figs. 3*).—This is a report of the final experiment of a series (E. S. R., 74, p. 838) on the use of fish meal and related feeds in dairy rations. Whitefish meal was com-

pared with linseed meal in the growing and milk-producing rations, the comparison being made on a protein equivalent rather than a weight basis. Two similar groups, each composed of 8 Jersey and 7 Holstein heifers, were started on experiment at 6 mo. of age and were carried on the test rations continuously up to the time of second calving.

No significant differences were noted in the rate of growth between the two groups of heifers, and the differences in milk and fat production during their first lactations in favor of the linseed meal ration were shown to be a matter of inherited milking ability rather than of feeding. Neither were there any consistent differences in birth weight of the calves from the dams on the two rations. However, calves from the fish meal group were more vigorous, the iodine contents of their thyroid glands were higher than for calves from the linseed meal group, and three cases of retained placenta occurred in the linseed meal group as contrasted with none in the fish meal group. It is concluded that whitefish meal compares very favorably with linseed meal on the basis of food nutrients furnished, and that fish meal is of special value in supplying iodine in the ration in regions where this element is deficient in natural feeds. This factor is considered to be of rather great importance in the producing ability, general health, and reproducing ability of dairy animals.

Gastric digestion of soybean flour, L. Shoptaw, D. L. Espe, and C. Y Cannon (*Jour. Dairy Sci., 20 (1937), No. 3, pp. 117–128, figs. 5*).—This report from the Iowa Experiment Station describes a series of trials in which both calves with Pavlov pouches and calves with gastric fistulas were employed to study the gastric digestion of soybean gruel (1 part of soybean flour to 9 parts of water) and of a "fortified" soybean gruel (⅓ of total solids from skim milk) in comparison with that of whole milk and skim milk. In some cases calves were fed at 12-hr. intervals, others at 8-hr. intervals, and in a few instances food was passed directly into the abomasum.

The results were analyzed in terms of (1) the cubic centimeters of gastric juice collected by half-hour periods from the Pavlov pouches and (2) the free and total acidity of the gastric contents. The soybean flour mixture left the stomach more readily than the milk curds. The amount of gastric juice secreted was approximately the same in both the milk and the soybean gruel trials, indicating that the comparatively poor results obtained with soybean flour as a feed for young calves (E. S. R., 75, p. 686) is not due to a diminished gastric digestion.

Second annual report of the dairy inspection service for the year ended December 31, 1936, C. W. England (*Maryland Sta. Bul. 408 (1937), pp. 377–387*).—This report outlines the scope of the inspection service as provided in the recently amended Maryland Dairy Inspection Law, reviews the work of the service since its inception, and lists the plants operating under the provisions of the law and the testers licensed in 1936.

A simplified procedure for calculating weights of milk to their energy equivalent in milk of different fat content in accordance with the Gaines formula, A. E. Perkins (*Jour. Dairy Sci., 20 (1937), No. 3, pp. 129–132*).—This note from the Ohio Experiment Station presents a set of factors for rapidly converting weights of milk of a given fat content to its energy equivalent weight of 4-percent milk in accordance with the Gaines formula (E. S. R., 59, p. 467). Also a simple method is outlined for converting milk of any fat content to its energy equivalent amount of milk of any other basic fat content.

[Abstracts of papers presented at the 38th annual meeting of the Society of American Bacteriologists] (*Jour. Bact., 33 (1937), No. 1, pp. 25, 26, 90–94*).—Abstracts of the following papers, dealing with subjects of significance in

dairying, are noted: The "Enterococcus" and "Lactic" Groups of the Streptococci, by J. M. Sherman, P. Stark, and E. S. Yawger, Jr.; The Gas-Producing Species of the Genus *Lactobacillus*, by C. S. Pederson; Surface Microflora of Limburger Cheese, by C. D. Kelly; Factors Affecting the Activity of Swiss Cheese Starter Cultures, by P. R. Elliker and W. C. Frazier; A Bio-physical Study of *Oospora lactis*, by J R. Kurtz, L. B. Schweiger, and E. H. Parfitt; The Action of Air Under Pressure in the Oxidation of Acetylmethylcarbinol to Diacetyl in Butter Cultures, by C. R. Brewer, M. B. Michaelian, C. H. Werkman, and B. W. Hammer; and Reaction of *Escherichia-Aerobacter* From Milk on Eijkman Medium, and Productivity of Media Used in the Isolation of *Escherichia-Acrobacter* From Milk, both by M. T. Bartram and L. A. Black.

Standard methods employed for controlling the bacteriological condition of market milk, R. S. BREED (*Milk Plant Mo., 26 (1937), No. 1, pp. 44, 46; also in 2. Internatl. Cong. Microbiol., London, 1936, Rpt. Proc., pp. 183–185*).—The author gives a brief account of the place occupied by the agar plate count, the direct microscopic count, and the methylene blue reduction test in the control of market milk in the United States and Canada, with information on trends in freqeuncy of usage of the various methods from 1910 to 1935.

The use of formate-ricinoleate broth in controlling and preventing ropy milk epidemics, L. R. CURTIS (*Jour. Dairy Sci., 20 (1937), No. 3, pp. 147–150*).—Concluding that most outbreaks of ropy milk are caused by members of the *Escherichia-Aerobacter* group of bacteria, the author points out the value of formate-ricinoleate broth in detecting ropy milk bacteria, with particular reference to faulty plant sanitation and methods. Milk samples collected at various stages of plant processing and showing gas formation may or may not become ropy, but samples showing no gas will rarely develop ropiness when placed at from 60° to 65° F.

Streptococcus durans n. sp., J. M. SHERMAN and H. U. WING (*Jour. Dairy Sci., 20 (1937), No. 3, pp. 165–167*).—An actively hemolytic streptococcus obtained from milk powder and previously designated as *S. hemothermophilus* (E. S. R., 74, p. 543) has been studied further and is fully described. *S. durans* is suggested as a more appropriate name for this organism.

A study of the factors affecting the color of Guernsey milk with the Pfund color grader and the Wood colorimeter, H. H. TUCKER, J. W. BARTLETT, A. S. FOX, and K. O. PFAU (*New Jersey Stas. Bul. 620 (1936), pp. 16, figs. 3*).—In the course of this study color readings were made on individual milk samples from all Guernsey cows in the herd at the North Jersey Substation on one day of each month from September 1933 to November 1935. Fat determinations were also made on all samples. The herd received a 20-percent protein concentrate mixture throughout the trial, dehydrated alfalfa or mixed hay and corn silage during the winter months, and pasture in season. Color readings were made with the Wood colorimeter throughout the trial and also with the Pfund color grader during the last 16 mo. of the study. In addition, certain short-time studies were conducted to test the effects of certain feeds and feeding practices on milk color.

The mean monthly color values indicated that milk is relatively high in color from May to October and relatively low in color the rest of the year, with the lowest color values observed during the 2 mo. just prior to the time cows were turned on pasture. The feeding of 12 lb. of dehydrated alfalfa that had been stored for 6 mo. or 5 oz. of a carotene concentrate per cow daily during the late winter months had no effect on increasing the yellow color of the milk. The continued feeding of a ration of long field-cured hay, beet pulp, and grain resulted in a lower color in milk than was obtained from the dehydrated hay and silage ration.

Studies on the effect of stage of lactation showed that colostrum was highly colored and the most rapid drop in color occurred during the first 17 days after freshening, with a further gradual decline in the remainder of the first 30 days. The gradual decline in milk yield near the end of lactation was accompanied by gradual increase in percentage fat and in color. A coefficient of correlation of 0.6594±0.0056 was found to exist between fat percentage and color as measured by the Wood colorimeter. Daily samples twice weekly were considered adequate for studying short-time color effects, and samples over a 24-hr. period once a month were sufficient for study color over a lactation period.

Factors influencing the formation of milk layer in bottled coffee cream, L. H. Burgwald and J. L. Mooney (*Milk Dealer, 26 (1937), Nos. 4, pp. 40–42, 54, 56, 60, 62; 5, pp. 72–74, 76, 78, 80*).—This study was undertaken at the Ohio State University in an effort to determine plant practices which might be adapted to the control of the formation of the milk layer in market coffee cream. Data are presented on the effect of (1) varying pasteurizing temperatures, separating temperatures, and fat content of the separated cream, (2) standardizing with either whole milk or skim milk, (3) varying the creaming or storage temperature, and (4) agitation of the cream, on the depth of the resulting milk layer. It appears that low temperature pasteurization, which is accompanied by an excess of soluble calcium salts, low temperature separation, high creaming temperature, and agitation of cream at low temperatures are factors causing excessive milk-layer formation, while inversely high pasteurization and separation temperatures and low creaming temperatures reduced the amount of the milk layer.

Changes in the acetylmethylcarbinol plus diacetyl content of butter, W. L. Slatter and B. W. Hammer (*Iowa Sta. Res. Bul. 211 (1937), pp. 41–54*).—The essential conclusions presented have been previously noted (E. S. R., 77, p. 97).

Studies on the chemistry of Chedder cheese making, V, VI, R. M. Dolby, F. H. McDowall, and A. K. R. McDowell (*Jour. Dairy Res. [London], 8 (1937), No. 1, pp. 74–85, figs. 2; 86–91, figs. 2*).—This series of studies has been continued (E. S. R., 76, p. 388).

V. *Factors influencing the acidity and mineral content of cheese.*—Data are presented indicating that the degree of acidity developed in a vat of milk at the time the whey is run has an important influence on the quality of the resulting cheese. High acidity at this stage caused increased mineral losses in the whey with a corresponding decrease in the mineral content of the cheese, exerted a detrimental influence on the body of the cheese, and increased its acid character. Experimentally increasing the lactose content of cheese also produced a more acid product at maturity, although some unfermented lactose was present in the cheeses 4 mo. after manufacture.

VI. *Factors affecting the relation between lactic acid and titratable acidity in wheys.*—Results obtained in this phase of the study indicate a close relationship between the titratable acidity and the lactic acid concentration in wheys obtained under various cheese-making conditions. Variations in the rate of acid development or in the lactose content of the milk did not significantly affect this relationship. In curd with low mineral content there was less complete neutralization of lactic acid, resulting in wheys showing a somewhat higher titratable acidity for the same lactate content. This condition, however, affected only the wheys coming off late in the cheese-making process.

The effect of certain metallic contaminants on the Cheddar cheese making process, C. R. Barnicoat (*Jour. Dairy Res. [London], 8 (1937), No. 1, pp. 53–60*).—The additions of small quantities of soluble salts of copper, iron,

lead, zinc, aluminum, and manganese at such rates as to supply from 8 to 7 p. p. m. of the metals in milk prior to its use in Cheddar cheese making caused certain flavor and color defects in the mature cheese, although these were not evident when the cheese was graded at about 14 days after manufacture. The distribution of copper, iron, manganese, and lead between curd and whey fractions at different times during the cheese-making process is indicated. Discoloration in lead-contaminated cheeses appeared due to the formation of its sulfide, but in the case of iron and copper contamination discoloration was attributed to the atmospheric oxidation of a colorless metal: protein complex.

***Studies in Cheddar cheese.*—V, The effect of chemical substances on the ripening process,** W. L. Davies, J. G. Davis, D. V. Dearden, and A. T. R. Mattick (*Jour. Dairy Res.* [*London*], *8* (*1937*), *No. 1, pp. 92–104*).—Continuing this series of investigations (E. S. R., 76, p. 96), the effect of adding various chemical compounds to the curd on the rate of protein degradation during the cheese-ripening process has been determined. Eighteen compounds studied were classified as (1) substances stimulating or possibly stimulating the growth of lactic acid bacteria, (2) substances inhibiting or possibly inhibiting the growth of lactic acid bacteria, (3) substances affecting the H-ion concentration of the cheese, and (4) substances possibly affecting the flavor. The effect of these compounds in most cases was insignificant, cheese seeming to be remarkably stable. The chief factors affecting the rate of chemical ripening were the concentration of rennet, salt, and free water in the product.

Some factors influencing fat content in ice cream mix and the corresponding finished ice cream as determined by the Mojonnier method, J. J. Johnson and J. I. Ormond (*Jour. Dairy Sci.*, *20* (*1937*), *No. 3, pp. 159–164*).—From a study of the causes of variation in the fat content it appears that improper handling of the ice cream samples, such as violent and continued agitation during melting which causes a fat and solid separation to take place, making it impossible to get a representative sample for analysis, is the largest contributing factor. Extreme agitation of the ice cream mix results in a concentration of the fat and solids in the top layer with a corresponding reduction in the lower layer of the mix. Condensation of moisture in the standardized mix and in the ice cream during freezing causes some fat reduction. The addition of color and flavor at the freezer causes a calculable fat reduction.

What should ice cream stabilizers do? V. C. Stebnitz and H. H. Sommer (*Ice Cream Rev.*, *20* (*1937*), *No. 8, pp. 51, 52, 73, fig. 1*).—This article from the Wisconsin Experiment Station deals primarily with the desirable qualities of sodium alginate as an ice cream stabilizer. It appears that this product possesses all the desirable properties of gelatin and has some distinct advantages, notably the production of uniform viscosity of the mix, faster whipping, and ice cream with more desirable melting qualities.

The new proposed procedure for making ice cream counts, A. H. Robertson (*Ice Cream Rev.*, *20* (*1937*), *No. 8, pp. 74, 78, 80, 84, 87, 88*).—This report sets forth the plan and preliminary results of a cooperative undertaking to determine the relative efficiency of standard nutrient agar and tryptone skim milk glucose agar, each incubated at 32° and 37° C., for determining the bacterial content of ice cream mixes and ice cream.

VETERINARY MEDICINE

[Work with diseases and parasites by the Storrs Station] ([*Connecticut*] *Storrs Sta. Bul. 214* (*1937*), *pp. 10–14, 15–17*).—A brief review is given of the work of the year with diseases and parasites of livestock (E. S. R., 75, p. 252),

including infectious abortion and infectious mastitis (E. S. R., 76, p. 850; 77, pp. 396) of cattle; coccidiosis, paralysis (E. S. R., 76, p. 697), and laryngotracheitis and allied respiratory diseases of poultry; *Salmonella* infections in chicks (E. S. R., 76, p. 698); a disease of sheep caused by *Listerella* sp. (E. S. R., 77, p. 398); and parasites of the cottontail rabbit.

[Work in animal pathology by the Wisconsin Station] (*Wisconsin Sta. Bul. 438 (1937), pp. 36–43, 81, 82, 148, 149, fig. 1*).—Reference is made (E. S. R., 75, p. 537) to the value of sulfur in the prevention of coccidiosis (E. S. R., 76, p. 856) and to its failure to prevent blackhead, by C. A. Herrick and C. E. Holmes; further studies of mastitis, including control (by F. B. Hadley), relation of abnormal milk to (by E. G. Hastings), and effect of, on milk production; the failure of reactors to Bang's disease to transmit the disease to susceptible animals, by B. A. Beach and G. C. Humphrey; a study of red blood cells as an aid in the diagnosis of cattle diseases, by L. C. Ferguson; the toxicity of sweetclover hay; and the finding of a rapid growth of bovine and human types of tuberculosis bacteria to take place on a medium made from blackened potatoes, by J. R. McCarter and E. L. Tatum.

Selenium poisoning in fishes, M. M. Ellis, H. L. Motley, M. D. Ellis, and R. O. Jones (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 4, pp. 519–522*).—The results of a study on the toxicity of selenium poisoning in gill-breathing fishes, in which each of 150 goldfish were changed to fresh seleniferous water every 48 hr. and fed 3 standard pellets of shrimp meal immediately after being transferred, are reported.

A study of some acid-fast actinomycetes from soil, with special reference to pathogenicity for animals, R. E. Gordon and W. A. Hagan (*Jour. Infect. Diseases, 59 (1936), No. 2, pp. 200–206, fig. 1*).—A study was made of a number of acidfast actinomycetes isolated from soils and vegetable material. "Although the proportion of actinomycetes that are acidfast undoubtedly is small, nevertheless it is obvious that such organisms are not rare in soil. A comparison of the cultural features of these organisms with one another and with those of actinomycetes isolated from lesions in man and animals shows that a close relationship exists between them. In fact we have not found any features that will serve to distinguish the 'pathogenic' types from the soil types. The character of the pigment formed will distinguish some strains from others; however, both pathogenic and soil types are usually pigmented, the colors ranging from yellow through orange to coral. One of the soil types was highly virulent for rabbits soon after it was isolated, producing in this species a disease which was not distinguishable from that produced by the pathogenic types. The soil types possessed little or no pathogenicity for guinea pigs, whereas the pathogenic types produced fatal infections."

The occurrence of *Bacillus necrophorus* agglutinins in different species of animals, W. H. Feldman, H. R. Hester, and F. P. Wherry (*Jour. Infect. Diseases, 59 (1936), No. 2, pp. 159–170, figs. 2*).—In the studies here reported *B. necrophorus* agglutinins have been shown to be present spontaneously in a large majority of normal-appearing adult horses, cattle, sheep, and swine. "In most instances the presence in cattle of hepatic abscesses containing *B. necrophorus* is not associated with an appreciable increase in the titer of *B. necrophorus* agglutinins. The serums of calves, rabbits, white rats, lambs, and human beings are essentially devoid of *B. necrophorus* agglutinins. There is no evidence that different species of animals are affected with distinct varieties of *B. necrophorus*. Serologically there exists a definite relationship between *B. necrophorus* agglutinins in the blood serums of sheep, swine, horses, and adult cattle in that they agglutinate antigens prepared from several strains

of *B. necrophorus* obtained from lesions in a single species. For the detection of obscure lesions associated with *B. necrophorus*, it would seem unwise to attribute diagnostic significance to the presence of *B. necrophorus* agglutinins in adult horses, swine, sheep, or cattle."

The animal reservoirs of brucellosis, W. A. Hagan (*Cornell Vet.*, 27 (*1937*), *No. 1, pp. 14–20*).—The susceptibility of sheep, horses, dogs, and birds to *Brucella* infection is considered, an attempt being made to evaluate this hazard as a source of human infection. It is concluded that three degrees of susceptibility to *Brucella* infection may be distinguished among domestic animals. The contribution is presented with a list of 28 references to the literature. See also a previous note (E. S. R., 77, p. 393).

Infectious catarrh of mice, I–III, J. B. Nelson (*Jour. Expt. Med.*, *65* (*1937*), *No. 6, pp. 833–860, pls. 2*).—The present contribution deals with the nature and etiology of a disease observed in Swiss mice at Princeton, N. J., which had not been previously described or at least not recognized as a distinct entity.

Part 1 (pp. 833–841) reports upon a natural outbreak of the disease, the mortality of which in a group of 75 naturally infected mice was 95 percent over a period of 11 mo. Part 2 (pp. 843–849) reports upon the detection and isolation of small Gram-negative cells resembling the so-called coccobacilliform bodies of fowl coryza which were regularly found in the nasal and middle ear exudate of mice naturally and experimentally infected with catarrh. A second organism cultivable in fluid blood media with the formation of compact clumps and similar to the X bacillus of chickens was also isolated from infected mice. Part 3 (pp. 851–860) reports upon the etiological significance of these bodies, the disease having been regularly produced in normal mice by the nasal instillation of primary tissue cultures.

Spontaneous encephalomyelitis of mice, a new virus disease, M. Theiler (*Jour. Expt. Med.*, *65* (*1937*), *No. 5, pp. 705–719*).—The characteristics of a filtrable virus obtained from mice found spontaneously paralyzed and showing lesions of encephalomyelitis are described. The virus is not pathogenic for rhesus monkeys, and no evidence of immunological relationship with the virus of human poliomyelitis has been obtained.

Direct transmission of human influenza virus to mice, T. Francis, Jr., and T. P. Magill (*Soc. Expt. Biol. and Med. Proc.*, *36* (*1937*), *No. 2, pp. 132, 133*).—The authors have found it possible to establish infection with human influenza virus in mice through direct intranasal inoculation with throat washings obtained from patients acutely ill with influenza.

Hemorrhagic septicemia, J. B. Taylor (*South Dakota Sta. Bul. 307* (*1937*), *pp. 8*).—A practical account of hemorrhagic septicemia met with in cattle, sheep, swine, and fowls.

The local points of defense and the passive transfer of acquired immunity to Nippostrongylus muris in rats, M. P. Sarles and W. H. Taliaferro (*Jour. Infect. Diseases*, *59* (*1936*), *No. 2, pp. 207–220, figs. 3*).—The authors studied the mechanism of acquired immunity to *N. muris* by comparing the migration and development of the parasite in normal and hyperimmunized rats at short intervals during the previously unstudied first week of the infection and by passive transfer.

"In actively hyperimmunized rats the worms were retained and killed, to a small extent in the skin and to a larger extent in the lungs; of those that migrated to the intestine many were delayed, and upon their arrival the majority not only failed to grow or produce eggs but failed to remain. . . . Passive transfer of immunity was obtained by giving intraperitoneal injections of serum from hyperimmunized rats in doses of 4.1, 4.5, and 6.0 cc. (per 100 g

rat) to rats at the time of cutaneous infection with 3,400 or 4,000 larvae. . . . The finding of stunted and immature worms in immune rats and the passive transfer of the immunity, together with the finding of a precipitate around and in the gut of worms in the skin and lungs of immune rats in preliminary histological studies, indicate that the immunity to *N. muris* is essentially a local immunity in strategically placed organs, i. e., in the skin, lungs, and intestine, and has to a large extent an antibody basis."

Serological reactions with a virus causing rabbit papillomas which become cancerous, I, II, J. G. KIDD, J. W. BEARD, and P. ROUS (*Jour. Expt. Med., 64 (1936), No. 1, pp. 63–96, pls. 2, figs. 2*).—Part 1 of this contribution (pp. 63–77) reports upon tests of the blood of animals carrying the papilloma; part 2 (pp. 79–96), upon tests of the blood of animals carrying various epithelial tumors. A description is given of a method that has been devised for serological tests with a virus producing rabbit papillomas that become carcinomatous.

***A complement-fixation reaction involving the rabbit papilloma virus* (Shope),** J. G. KIDD (*Soc. Expt. Biol. and Med. Proc., 35 (1937), No. 4, pp. 612–614*).—In this further contribution (see above) a complement fixation reaction with extracts of filtrates of papillomas containing infective Shope virus and antiserums effective against the latter is described.

Studies on an epizootic in domestic rabbits caused by Pasteurella cuniculicida, F. D. MCKENNEY and J. E. SHILLINGER (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 6, pp. 755–768*).—A report is made of an epizootic in domestic rabbits in which *P. cuniculicida* was isolated as the causative organism. "Three forms of the infection were recognized: (1) An acute, rapidly fatal, septicemic form; (2) a subacute nasal rhinitis form; and (3) a chronic type expressed by subcutaneous abscesses. Cultures from all three types were used in transmitting the disease, but the type produced depends on the individual resistance of the animal and not on the source of the infective material. There is no certainty that such transmissions can be repeated indefinitely."

p-Aminobenzenesulfonamide and antipneumococcal serum therapy in type I pneumococcal infections of rats, P. GROSS and F. B. COOPER (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 4, pp. 535–540, fig. 1*).—In experimental work with pneumococcal infections (type I) of rats, the details of which are given in tables, it was found that in the relative dosages employed the efficacy of *p*-aminobenzenesulfonamide is as great as, if not greater than, that of the specific serum. The data obtained show that the best therapeutic results came from a combination of serum and drug, indicating that the two methods of treatment are synergistic.

An improved spiral glass electrode and vacuum tube potentiometer applied to the measurement of serum pH in experimental Streptococcus infections in rabbits, P. J. HARTSUCH (*Jour. Infect. Diseases, 59 (1936), No. 2, pp. 183–199, figs. 9*).—A description is given of an improved apparatus.

A preliminary report on the problem of the bovine skin-lesion tuberculin-reactor, A. ROBERTSON and N. H. HOLE (*Jour. Compar. Path. and Ther., 50 (1937), No. 1, pp. 39–57*).—A preliminary report is made on a number of bovine skin-lesion tuberculin-reactors examined at the laboratory at Weybridge, England. The results of the examinations and a review of the literature have led to the tentative conclusion that the skin lesions are the most probable cause of the sensitization to tuberculin, and that the sensitization is not consistently greater for avian than for bovine tuberculins or vice versa; neither does the subcutaneous test appear to afford a means of differentiating the skin lesions from true tuberculosis. "We admit the possibility of the lesions being due to

an atypical form of *M[ycobacterium] tuberculosis*. However, in view of the microscopical appearance of the organisms, certain histological features of the lesions, failure to infect laboratory animals, and failure to cultivate the organism, we are of the opinion that the acidfast organisms seen probably do not belong to the recognized pathogenic types, although they may be associated in a group sensitization." It is pointed out that the acidfast organisms may not necessarily be the primary cause of the lesions but be secondary invaders of a wound or abscess.

A list is given of 44 references to the literature.

Influence of host factors on neuroinvasiveness of vesicular stomatitis virus, I, II, A. B. Sabin and P. K. Olitsky (*Jour. Expt. Med., 66 (1937), No. 1, pp. 15–34, fig. 1; pp. 35–57, fig. 1*).—Part 1 of this contribution reports upon the effect of age on the invasion of the brain of young mice by vesicular stomatitis virus instilled in the nose; part 2 on the effect of age on the invasion of the peripheral and central nervous systems by virus injected into the leg muscles or the eye.

On the occurrence of copulation infection among cattle with infectious abortion, A. Thomsen (*Jour. Compar. Path. and Ther., 50 (1937), No. 1, pp. 1–9*).—Experiments conducted with 3 bulls and 15 heifers, besides 4 control heifers, are reported, the details being given in table form.

Brucella abortus in raw market milk, C. P. Fitch and L. M. Bishop (*Cornell Vet., 27 (1937), No. 1, pp. 37–41*).—The milk from 67 dairies selling raw milk to a municipality was tested by the Minnesota Experiment Station, the presence of *B. abortus* being demonstrated in 25.4 percent. When agglutinins for *Brucella* could be demonstrated in a 1:25 dilution in a test of raw market milk, living *Brucella* organisms could usually be found. In all, 112 strains of *B. abortus* isolated from cattle were typed, 4 of which were *B. suis* strains and 108 *B. abortus strains*. A list of 15 references to the literature is included.

Anaplasmosis in cattle, H. Schmidt (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 6, pp. 723–736, figs. 2*).—Following a brief discussion of its nature and manner of transmission, the susceptibility, immunity, immunization, and treatment of anaplasmosis in cattle, based upon a review of the literature and work at the Texas Experiment Station, are considered.

In the course of immunization work it was observed that following the injection of carrier blood containing anaplasmata and piroplasmata the reaction to the former began from the third to the sixteenth day and the second reaction, due to anaplasmata, began anywhere from the seventeenth to the forty-eighth day, the longer period of incubation being exceptional. Of 309 animals inoculated from two different blood donors, 9 had a period of incubation of from 45 to 48 days, while in 187 animals the period of incubation ranged from 29 to 38 days and 17 had an incubation period of 17 days.

Tables are given which show (1) the period of incubation in a group of 19 2-year-old bulls inoculated on the same day, each with 1.5 cc of fresh defibrinated blood drawn from the same animal which harbored only anaplasmata, and (2) the survival period of *Anaplasma marginale* and *Piroplasma bigeminum* in infected blood kept at room temperature and also at ice box temperature. Charts which show the temperature curves of 3 of the bulls are included.

Use of formolized anti-blackleg vaccine in calves [trans. title], L. de Blieck and J. Jansen (*Tijdschr. Diergeneesk., 64 (1937), No. 10, pp. 513–519; Ger., Eng., Fr. abs., p. 517*).—On 51 farms infected with blackleg on which 290 bovines (nearly all calves) were inoculated once with 5 cc of formolized anti-blackleg vaccine, blackleg due to inoculation was not observed and none of the vaccinated animals contracted the disease. The authors conclude that formolized anti-blackleg vaccine is the best for use against this disease.

Hemorrhagic septicemia investigations: The significance of Pasteurella boviseptica encountered in the blood of some Florida cattle, D. A. Sanders (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 6, pp. 737–748*).—Contributing from the Florida Experiment Station, the author reports that *P. boviseptica* is frequently encountered at autopsy in the blood and internal organs of cattle in that State. Exposure of calves, yearlings, and cows to this organism by means of ingestion and nasal spray failed to produce septicemia. The organism was recovered from the nasopharynx of cattle showing no gross lesions 3 mo. following mild exposure by means of nasal sprays and from the frontal sinus 2 mo. following introduction by means of trephining. *P. boviseptica* may be demonstrated in the blood and internal organs of cattle shortly after death incident to *Anaplasma marginale* infection and in the blood and internal organs of cattle autopsied following *Crotalaria spectabilis* poisoning. "*P. boviseptica*, colon-type, and other organisms may frequently be isolated from the blood stream of cattle showing advanced symptoms of bronchopneumonia and pulmonary emphysema which [have] developed incident to railway transportation. Umbilical injections of *P. boviseptica* in suckling calves produce symptoms and lesions of omphalophlebitis. *P. boviseptica* produced acute and chronic *Pasteurella* infection in the crow (*Corvus ossifragus*) when the organisms were instilled into the nasal cleft or when the drinking water was contaminated. *P. boviseptica* organisms encountered in these investigations were lethal for rabbits in amounts of 0.001 cc of a 24-hr. salts bouillon culture given intraperitoneally or when a drop of the whole culture was instilled into the nasal passage.

"The demonstration of *Pasteurella* in bovine carcass material of suspicious hemorrhagic septicemia cases and its virulence for rabbits cannot always be accepted as a criterion regarding the etiological significance of such organism. Realizing different degrees of virulence attributed to strains of *Pasteurella* under variable conditions, no evaluation is claimed for organisms other than those encountered and examined in these studies or for their action on animals under conditions other than those undertaken in the investigation."

Hemorrhagic septicemia (*Cornell Vet., 26 (1936), No. 1, pp. 51–56, 56–58; 27 (1937), No. 1, pp. 52–62*).—In the first paper a report of a hemorrhagic septicemia outbreak in a herd after the use of bacterins and the successful handling of this disease in a small herd, together with a discussion of anaphylaxis following administration of antihemorrhagic septicemia biologics, is given by M. G. Fincher. In the second, W. J. Gibbons reports upon the occurrence and treatment of cases of hemorrhagic septicemia. In the third, Gibbons and Fincher report upon the occurrence and treatment of hemorrhagic septicemia in 7 herds of cattle. Of the 379 head of cattle in these herds, 55 were affected and 6 died. In the treatment of the disease the use of serum appears to have been beneficial. Homologous serum was the most effective.

A comparison of the microscopic test, Hotis test, and blood agar plate in detecting streptococci of mastitis in milk, C. S. Bryan and E. D. Devereux (*Cornell Vet., 27 (1937), No. 1, pp. 68–74*).—In comparative studies at the Michigan Experiment Station the culture in blood agar detected an average of 89 percent of all milk samples that were shown to contain mastitis streptococci in the microscopic test, a description of which has been noted (E. S. R., 73, p. 103). "Considering the results of the microscopic test as accurate in detecting the presence of mastitis streptococci, the 24-hr. reading of the Hotis test (E. S. R., 76, p. 391) will detect from 52.8 to 64.3 percent of the composite samples positive in the microscopic test. The results of the 48-hr. reading of the Hotis test will detect from 62.2 to 71.4 percent of the composite samples

positive in the microscopic test. When quarter samples of milk are tested, the 24-hr. reading of the Hotis test will detect 64.3 percent and the 48-hr. reading will detect 78.6 percent of the samples positive in the microscopic test. The Hotis test gives rise to many suspicious reactions. These do not permit a definite determination of the presence or absence of mastitis streptococci. The results of the Hotis test are not constant on repeated testing of milk from positive or negative cows, the results remaining negative or positive in the microscopic test and blood agar plate during this time."

The reliability of selected tests for the detection of mastitis, A. O. Shaw, H. C. Hansen, and R. C. Nutting (*Jour. Dairy Sci., 20 (1937), No. 4, pp. 199–203*).—An examination made by the Idaho Experiment Station of 518 samples of milk taken from 10 cows over a 14-day period, using tests to demonstrate the presence of streptococci in incubated samples, hemolytic bacteria, cell count, chloride content, and H-ion concentration, is considered to have demonstrated "(1) the presence of streptococci in 92.5 percent of the samples taken from cows giving abnormal milk, 36.6 percent of the samples taken from cows having mild chronic mastitis, and 7.1 percent of the samples taken from cows definitely free from mastitis, (2) the presence of hemolytic bacteria in 82.5 percent of the samples obtained from cows secreting milk abnormal in appearance, 25 percent of the milk samples from cows having mild chronic mastitis, and 1.9 percent of the samples taken from definitely negative cows, (3) the presence of cell in excess of 100,000 per cubic centimeter in 87.7 percent of the samples taken from cows secreting abnormal milk, 27.7 percent of the samples taken from mild chronic mastitis, and 5.8 percent of the samples taken from negative cases, [and that] (4) the tests using the percentage of chlorides and H-ion concentration were extremely unreliable in detecting cows suffering from chronic mastitis."

Chronic bovine mastitis and milk yield, G. C. White, G. W. Couture, E. O. Anderson, R. E. Johnson, W. N. Plastridge, and F. J. Weirether (*Jour. Dairy Sci., 20 (1937), No. 4, pp. 171–180, figs. 3*).—A comparison was made by the [Connecticut] Storrs Experiment Station of the production of animals before and after the development of laboratory evidence of mastitis, some of the animals being in the early stages of infection while in others the disease was latent in character. In many cases no clinical evidence was observable during most of the mastitis reacting periods. The data obtained tend to show that a loss in yield may occur in the majority of cases during the incipient stage of the disease.

"In 240-day lactations of a group of 30 cows having a history both as mastitis free and mastitis positive based on the bromothymol blue test, the sediment test, the leucocyte count, and the shedding of organisms, there was a loss of 463 lb. of milk attributable to mastitis. In another herd of 22 cows there was a loss in yield of 425 lb. These reductions are between 4 and 5 percent and are not particularly significant. A loss in yield was manifested in about two-thirds of the individual cases. When only one quarter was positive there was no loss in yield. Such are usually incipient stages, and possibly also compensation in yield is made by the unaffected quarters. The loss, however, increased in magnitude with each additional quarter involved, amounting to about 15–20 percent with all four quarters positive. When the results were segregated for each diagnostic test it was found that for those reacting to the bromothymol blue test the loss in yield was 837 lb., and for those shedding *S[treptococcus] mastitidis* the loss amounted to 1,100 lb. per lactation. The loss in yield of sediment positives was 596 lb. and of leucocyte positives 573 lb. No effect on the butterfat percentage was observed."

Trichomonas disease of cattle (*Vet. Rec.*, *49* (*1937*), *Nos. 8*, *pp. 211–223*, *224*, *figs. 4*; *9*, *pp. 247–256*).—*This contribution consists of a review of the* literature, accompanied by a list of 77 references, and laboratory data by A. W. Stableforth and N. J. Scorgie and a description of the outbreak by G. N. Gould, including a report on the histological examination by E. G. White.

Human tuberculosis in cattle, N. Plum (*Skand. Vet. Tidskr.*, *26* (*1936*), *No. 12*, *pp. 645–667*; *Dan. abs.*, *pp. 666*, *667*).—Following a brief reference to earlier reports on the infection of cattle with human tubercle bacilli, cases are described in which cows after infection with human type tubercle bacilli apparently gave positive reactions to the intracutaneous tuberculin test. A report is made of a field experiment in which a human with plumonary tuberculosis (typus humanus) through stable contact sensitized all of the animals to tuberculin. Experiments in which animals were fed tuberculous expectorate are also reported.

The clinical examination of cattle for the presence of open tuberculosis as practised in the Ostertag method of tuberculosis control and eradication, G. B. Brook (*Vet. Rec.*, *49* (*1937*), *No. 10*, *pp. 279–292*, *figs. 18*).—This extended account is accompanied by a list of 23 references to the literature.

The fundamental features of the struggle in Denmark against tuberculosis in cattle, N. Plum (*Skand. Vet. Tidskr.*, *27* (*1937*), *No. 4*, *pp. 157–172*; *Eng. abs.*, *pp. 169–172*).—A report upon the control work in Denmark.

The nature, epidemiology, and control of sheep myiasis in Britain: A summary of our present knowledge, J. MacLeod (*Jour. Compar. Path. and Ther.*, *50* (*1937*), *No. 1*, *pp. 10–32*).—This contribution reports upon the nature of sheep strike, the history of sheep myiasis in Britain, the bionomics of *Lucilia sericata*, the factors affecting the occurrence of strike, the types and development of strike, seasonal changes in strike incidence, and control measures.

Some important parasites of sheep from British Guiana, H. V. M. Metivier (*Trop. Agr.* [*Trinidad*], *14* (*1937*), *No. 1*, *p. 4*).—Brief notes are presented on the stomach worm (*Haemonchus contortus*), *Trichostrongylus instabilis*, *Monodontus trigonocephalus*, and the nodular worm *Oesophagostomum columbianum*.

Bacterial infection as a sequel to Ixodes attack of lambs [trans. title], P. Hellesnes and F. V. Holmboe (*Norsk. Vet. Tidsskr.*, *49* (*1937*), *No*, *2*, *pp. 41–50*; *Eng. abs.*, *p. 50*).—A discussion of infection and abscess formation resulting from the attachment of ticks to lambs in several districts of west Norway, in which staphylococci, *Bacterium pyogenes*, and streptococci, including in one case hemolyzing streptococci, were isolated.

Infectious pleuro-pneumonia of goats in Palestine: Communicability to sheep, S. J. Gilbert (*Jour. Compar. Path. and Ther.*, *50* (*1937*), *No. 1*, *pp. 33–38*, *figs. 2*).—An investigation of an outbreak in Palestine is reported upon.

Further studies of diseases affecting moose, II, R. Fenstermacher (*Cornell. Vet.*, *27* (*1937*), *No. 1*, *pp. 25–37*, *figs. 5*).—This contribution from the Minnesota Experiment Station reports upon the examination and study of 5 moose additional to the 18 previously noted (E. S. R., 72, p. 694). The symptomatology, necropsy findings, histopathological examinations, blood studies, serological and bacteriological findings, experimental animal inoculations, and tick attachment experiments are reported upon.

Swine erysipelas, G. L. Dunlap and R. Graham (*Illinois Sta. Circ.*, *471* (*1937*), *pp. 13*, *figs. 11*).—A practical account of swine erysipelas, which, in both acute and chronic forms, has been recognized for many years in central and northern Illinois and has resulted in serious death losses in farm herds.

Active immunization against swine plague by formolized vaccine [trans. title], L. F. D. E. Lourens and C. J. de Gier (*Tijdschr. Diergeneesk.*, *64* (*1937*),

No. 8, pp. 398–411; Ger., Eng., Fr. abs., pp. 409–411).—Laboratory experiments and the inoculation of some 35,000 pigs in the field led to the conclusion that a formolized vaccine for swine plague, prepared according to the methods employed in Japan, gives an immunity that is sufficient to restrict the damage inflicted by the disease to a large extent.

Variations in inorganic phosphorus and calcium content of the blood of horses, B. J. ERRINGTON (*Cornell Vet., 27 (1937), No. 1, pp. 1–13, figs. 2*).—A report is made of a study of the inorganic phosphorus and total calcium in the blood serum of horses.

Complement fixation test differentiating 3 strains of equine encephalomyelitic virus and the virus of lymphocytic choriomeningitis, B. F. HOWITT (*Soc. Expt. Biol. and Med. Proc., 35 (1937), No. 4, pp. 526–528*).—It has been found that the complement fixation test may be employed in the differentiation of strains of equine encephalomyelitic virus and the lymphocytic choriomeningitis virus of C. Armstrong and R. D. Lillie.[5] Thus far the test has been specific for the homologous strains when strongly hyperimmunized serums were used together with a potent antigen.

Midwinter equine encephalitis, L. P. DOYLE (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 6, pp. 786–788, figs. 2*).—A report upon the pathology of a case of equine encephalitis that occurred in Indiana in January, contributed by the Indiana Experiment Station.

Bacterial resistance in B-deficient dogs, S. B. and W. B. ROSE (*Jour. Infect. Diseases, 59 (1936), No. 2, pp. 174–182, fig. 1*).—When dogs, the diet of which was complete except for vitamin B, were inoculated with *Staphylococcus aureus* the results indicated that animals rendered partially deficient with respect to vitamin B are more susceptible to the deleterious effects of artificial infection with *S. aureus*. The surviving B-deficient dogs had positive blood cultures for a longer period of time (average 12.2 and 6 days) than the caloric control animals. The vitamin-deprived dogs lost approximately twice as much weight as the control animals during the first 10 days after infection. The mechanism of the action of vitamin B is unknown. In the present state of knowledge it appears that this vitamin acts through its influence in helping to maintain an optimum nutritive state of the tissues; the resultant better physiologic condition of the animal seems to be of some importance in overcoming an experimental infection.

Streptococcic infections in dogs.—I, "Acid milk", arthritis, and postvaccination abscesses, H. J. STAFSETH, W. W. THOMPSON, and L. NEU (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 6, pp. 769–780*).—In work at the Michigan Experiment Station evidence was found that infections rather than acid milk are responsible for early pup mortality. A streptococcus commonly encountered in the female genital tract and pups that have died of so-called acid milk is described as new under the name *Streptococcus canis*. The authors have found streptococci present in pus from abscesses resulting from antirabies vaccination.

Two cases of articular and muscular rheumatism or arthritis, apparently successfully treated with vaccine therapy, are described.

Some observations on the use of "Prontosil" in canine practice, A. WHICHER and H. L. SMITH (*Vet. Rec., 49 (1937), No. 15, pp. 452, 453*).—In four of five cases in which *Streptococcus hemolyticus* was involved Prontosil appeared to have exerted a specific curative action.

[Work in poultry pathology by the New Jersey Stations], F. R. BEAUDETTE (*New Jersey Stas. Rpt. 1936, pp. 89–91*).—Reference is made (E. S. R., 75, p.

[5] Pub. Health Rpts. [U. S.], 49 (1934), No. 35, pp. 1019–1027, fig. 1.

691) to the diagnosis of poultry diseases during the year, including the occurrence of a thorny-headed worm, probably *Plagiorhynchus formosus*, in a white-throated sparrow, thought to be a new host, and *Haemoproteus columbae* in pigeons from South Carolina; investigations of infectious laryngotracheitis; a study of fowl paralysis; and paratyphoid infection in pigeons.

Internal parasites of poultry, R. Graham, J. P. Torrey, J. D. Mizelle, and V. M. Michael (*Illinois Sta. Circ. 469 (1937), pp. 50, figs. 39*).—A compilation of information on internal parasites of poultry, including flatworms and roundworms and their control and prevention. An outline of primary and intermediate hosts, including illustrations of the adults of the intermediate hosts, together with a list of 28 references to the literature examined, follows.

Fowl cholera, F. R. Beaudette and J. J. Black (*New Jersey Stas. Hints to Poultrymen, 24 (1937), No. 3, pp. 4*).—A practical account.

Coccidiosis in chickens, C. A. Herrick and C. E. Holmes (*Wisconsin Sta. Spec. Bul., 1937, Apr., pp. 7, pl. 1*).—A practical account of coccidiosis in chickens which includes information on the use of sulfur, a report upon which by the authors has been noted (E. S. R., 76, p. 856).

Hemophile bacilli in the spleen of cases of fowl coryza [trans. title], C. A. Van Dorssen (*Tijdschr. Diergeneesk., 64 (1937), No. 5, pp. 225, 226–228; Ger., Eng., Fr. abs., p. 228*).—In two experimental cases of fowl coryza of rapid onset, the author succeeded in isolating *Hemophilus coryzae* (= *gallinarum*) from the spleen. Both fowls were in poor condition and anemic. In the bird that died, a fibrinous pneumonia was found at necropsy from which *H. coryzae* was isolated. No lesions were found in the anterior air passages. In the other fowl, which was killed, the author found no lesions aside from a mucopurulent rhinitis. By intranasal infection with the isolated strains the author was able to set up coryza of rapid onset in fowls.

The etiology of fowl paralysis, leukemia, and allied conditions in animals, VII, VIII, M. W. Emmel (*Florida Sta. Bul. 306 (1936), pp. 42, figs. 9*).—This further contribution (E. S. R., 77, p. 254) is presented in two parts as follows:

VII. *Hemocytoblastosis in chickens as induced by Salmonella aertrycke* (pp. 5–33).—It is pointed out that hemocytoblastosis as discussed in this contribution is a fundamental process in the development of many of the various pathologic manifestations resulting from infection by many species of the genus *Salmonella*. It also results from the injection of organ emulsions and filtrates of leukemic birds, commonly known as the transmission agent and referred to by some investigators as a filtrable virus.

"Experiments conducted to determine the effect of hemocytoblastosis on the growth curve show that in one instance 10 Barred Rock chickens, equally divided as to males and females, infected by the intravenous injection of a suspension of *S. aertrycke* when 3 weeks of age, averaged 696 g in weight when the birds were 10 weeks of age, as compared to an average weight of 924 g in the noninfected group. A repetition of this experiment with an equal number of Rhode Island Red chickens showed a difference of 190 g per bird in favor of the noninfected group when 10 weeks of age. Hemocytoblastosis has been diagnosed in 10 flocks of laying birds in which this process was the only pathologic manifestation occurring. Marked reduction in egg production was noted in all flocks. Scaly and more or less atrophied comb and wattles are the principal symptoms shown. A shorter incubation period results when birds are exposed to *S. aertrycke* during 'active' hemocytoblastosis. Birds showing 'recessive' hemocytoblastosis, or which have recovered from the process, show considerable immunity to subsequent infection by *S. aertrycke* as long as 6 mo.

"According to the conception of hemocytoblastosis advanced in this study, birds recover from this process in instances in which other pathologic manifestations do not develop. Many birds never show external symptoms of hemocytoblastosis. The rate of recovery depends in a large measure upon the intensity of the process. Recovery often requires as long as 3 to 6 mo. The course of hemocytoblastosis, once established, is dependent almost entirely upon the individual resistance of the bird."

VIII. *Hemocytoblastosis in naturally occurring cases of fowl paralysis and lymphomatosis, as well as in other birds from the same flocks* (pp. 35–41).—This contribution deals with hemocytoblastosis as concerned with naturally occurring cases of fowl paralysis and lymphomatosis, as well as in other birds from the same flocks in which these pathologic manifestations were observed.

"One hundred birds 6 to 52 weeks of age from 44 sources affected with fowl paralysis, 40 birds 14 to 98 weeks of age from 18 sources affected with lymphomatosis, 40 birds 6 to 33 weeks of age from 24 different flocks affected with 'light', anemia, and unthriftiness, and 75 apparently normal birds 6 to 28 weeks of age from 14 flocks in which fowl paralysis was occurring showed by total and differential blood counts that hemocytoblastosis was present. In general the degree of hemocytoblastosis varied to some extent in the different groups studied. Hemocytoblastosis was more pronounced in the group affected with light, anemia, and unthriftiness and less pronounced in the group affected with lymphomatosis. Birds affected with fowl paralysis and apparently normal birds associated with outbreaks of fowl paralysis occupied a place between these two extremes, hemocytoblastosis being slightly more severe in the group affected with fowl paralysis."

It is considered likely, in naturally occurring outbreaks of this group of diseases, that most of the entire flock become infected to some degree, although not necessarily sufficient to develop into one of the pathologic manifestations.

The importance of endotoxin of Salmonella aertrycke in the development of fowl paralysis, M. W. Emmel (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 6, pp. 749–754*).—In connection with the work with fowl paralysis noted above, the author reports having found that the intravenous injection of endotoxin of *S. aertrycke* often results in transient but typical symptoms of fowl paralysis. "Birds show a progressive age resistance to the neurotoxic action of endotoxin. Repeated intravenous injection of endotoxin in chickens results in mild hemocytoblastosis, but repeated intravenous, intracerebral, or intraperitoneal injections will not result in fowl paralysis. Endotoxin in varying amounts in vitro inhibits agglutination and reduces the titer of *S. aertrycke*-immune serum and inhibits phagocytosis. *S. aertrycke* alone induced fowl paralysis in 22 of 108 birds 6 to 12 weeks of age, while the same number of causal micro-organisms plus 1 cc of endotoxin induced fowl paralysis in 53 of 105 birds of the same age. By the injection of endotoxin into baby chicks it was possible to predict, with 86.7 percent accuracy, the development of fowl paralysis when the same birds became 8 to 12 weeks of age and exposed to repeated intravenous injections of *S. aertrycke*."

A study of fowl paralysis, C. W. Barber (*Cornell Vet., 27 (1937), No. 1, pp. 42–51*).—Transmission experiments in which 434 chickens were used in an attempt to transmit fowl paralysis are reported upon, the details being given in tables. In four of the experiments reported the percentage of paralyzed birds in the inoculated groups was slightly higher than in the controls. "The highest percentage of paralysis in any one group was 16 percent. Other factors than percentage have to be considered. The mortality among the control groups was very high. The control groups were slightly smaller than the test groups.

The period elapsing between the time of the inoculations and the appearance of paralysis was exceedingly variable. Some birds became paralyzed 9 and 10 mo. after the inoculation. The results of these experiments do not definitely indicate the successful transmission of fowl paralysis."

A study of naturally infected field cases of avian typhoid, H. C. GAUGER (*North Carolina Sta. Tech. Bul. 53 (1937), pp. 63, figs. 8*).—Studies on seven fatal and eight carrier cases of avian typhoid contracted under natural conditions are reported, the details being given in numerous tables. "The external symptoms in the naturally infected field cases as received in various stages of the disease did not vary to any marked extent [from] external symptoms already recorded by other workers. It was possible to recover *S[almonella] gallinarum* from the blood stream with relative frequency during the fastigial or high fever stage of the disease. . . . Cases under study yielded *S. gallinarum* in droppings during the stages of fastigium, decline, and convalescence, indicating the possibility of the perpetuation of *S. gallinarum* infection of the premises by birds in these stages of the disease. In these studies *S. gallinarum* was present in relatively large numbers in the fluids of the eyes, posterior nares, and pharynx during the fastigial stage. . . .

"Evidence of possible egg transmission of fowl typhoid is shown by the recovery of the causative organism from three eggs laid by three carrier cases. Tube agglutination tests conducted on the blood of survivor cases started from 4 to 30 weeks after receipt and conducted for a period of from 34 to 41 weeks were positive in each case in a dilution of 1:25 or greater. In most instances the titer of the last test was less than in the first. Antigens of *S. pullorum* and *S. gallinarum* were used, and higher titer was obtained with the *S. gallinarum* antigen. The continued presence of agglutinins for the duration of the periods noted above was probably due to the focalization of *S. gallinarum* and not to reinfection. A whole blood or tube agglutination test with *S. pullorum* or with *S. gallinarum* antigen applied to survivors of a fowl typhoid outbreak within 2 or 3 mo. after the disease has subsided should probably remove a large percentage if not all birds which are in the carrier stage. Autopsy findings in fatal cases (acute and subacute infections) were similar to those described by other workers. . . .

"In addition to the recovery of *S. gallinarum* from sources noted while under study, the causative organism was isolated from the livers of fatal cases and from blighted ova or from ovarian tissue or from both sites in all survivor cases. Three distinct morphological types of *S. gallinarum* were identified in the strains studied: *S* (smooth), *rS* (slightly rough), and *RRRR* (strong rough). Organisms recovered from the liver of fatal cases were of *S* type. Strains from the blighted ova and ovarian tissue of survivor cases and from infected eggs laid by these cases were of *rS* or a mixture of *S* and *rS* types. A single strain recovered from the droppings of a survivor bird was of the *RRRR* type. The presence of *S* type organisms in fatal cases and *rS* and *RRRR* types in survivor cases suggests a relationship between virulence and morphology to the extent that the *S* type or organism is probably more virulent than either the *rS* or *RRRR* type. The probability of greater virulence in the *S* type than in *RRRR* type or *rS* type was further shown in pathogenicity tests in which four out of seven test birds inoculated with *S* type organism succumbed to infection within 14 days following inoculation, whereas only one fatality occurred in the test birds inoculated with *rS*, *RRRR*, or a mixture of *rS* and *S* types. In the latter instance the inoculum consisted of a mixture of *rS* and *S* types. The results of biochemical tests applied to the organisms studied were characteristic of *S. gallinarum*."

The recent turkey disease, E. P. Johnson and G. W. Underhill (*South. Planter, 96* (*1935*), *No. 11, p. 28*).—This contribution from the Virginia Experiment Station calls attention to a disease of turkeys in various parts of Virginia. In the first outbreak, observed in 1933, approximately 30 percent of the young turkeys in the affected area died during July and August, and in the summer of 1934 the same section encountered a recurrence of the disease, with an approximate loss of 40 percent of the turkey crop. By 1935 it had spread and appeared in various parts of the State where turkey raising is a major enterprise, the loss ranging from 10 to 50 percent of all the turkeys in such areas.

Affected birds lose their appetite, appear droopy, and have a tendency to lie down. "When disturbed they may move with difficulty, and when excited in the later stages, they may fall over, gasp, go into a coma, and, finally, die. Visible symptoms usually last for only 2 or 3 days, at which stage the birds either die or recover. No outstanding gross lesions have been found with the exception of slight inflammation of the duodenum. The birds are usually somewhat emaciated and appear anemic. The flesh is usually flabby and the musculature of a brownish color. Occasionally small hemorrhages and ulcers occur in the intestines." On microscopic examination of blood smears from affected birds a protozoan has been found, usually in large numbers. This is thought to be spread by an intermediate host, such as the simulid or blackfly, commonly known as the turkey gnat, implicated by Skidmore in Nebraska in 1930 (E. S. R., 68, p. 825).

A blood disease of turkeys, E. P. Johnson and G. W. Underhill (*South. Planter, 98* (*1937*), *No. 1, pp. 34, 39, fig. 1*).—A practical account is given of the progress of work at the Virginia Experiment Station with the disease of turkeys noted above. In order to determine if certain flies of the genus *Simulium* are involved in the transmission of this leucocytozoon disease of the turkey, experimental houses were constructed and transmission experiments conducted which have shown the causative organism to be transmitted by a blackfly from infected to normal fowl.

Further records of the gizzard worm Amidostomum anseris in the State of Washington: Report of cases in wild waterfowl, A. C. Jerstad (*Jour. Amer. Vet. Med. Assoc., 90* (*1937*), *No. 6, pp. 785, 786*).—A brief report is made of cases of parasitism in certain species of wild waterfowl in Washington State that have come to attention since the earlier report of its occurrence in geese (E. S. R., 76, p. 108), in work conducted by the U. S. D. A. Bureau of Animal Industry in cooperation with the Western Washington Experiment Station.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the New Jersey Stations] (*New Jersey Stas. Rpt. 1936, pp. 25–27*).—The progress results are briefly presented of investigations on poultry houses, sweetpotato storages, the effect of tree roots on drain tile, and soil-saving terraces.

[Agricultural engineering investigations by the Wisconsin Station] (*Wisconsin Sta. Bul. 438* (*1937*), *pp. 18–27, figs. 4*).—The progress results are briefly presented of investigations which are being conducted on the one-story dairy barn, by F. W. Duffee, S. A. Witzel, H. D. Bruhn, and E. C. Meyer; electric fences and a pumping system for treating alfalfa silage with molasses, both by Duffee and Bruhn; electric brooders and dual-wheeled tractor trailers, both by Duffee, Bruhn, and Meyer; and hay chopping and storage, by Duffee, Bruhn, Meyer, L. F. Graber, G. Bohstedt, B. H. Roche, and E. B. Hart.

Surface water supply of the United States, 1935, Parts 8, 10, 12 (*U. S. Geol. Survey, Water-Supply Papers 788 (1937), pp. 197, pl. 1; 790 (1937), pp. 94, pl. 1; 792 (1937), pp. 166, pl. 1*).—These papers present the results of measurements of flow made on streams during the year ended September 30, 1935, No. 788 covering the western Gulf of Mexico basins; No. 790, the Great Basin; and No. 792, the Pacific slope basins in Washington and Upper Columbia River Basin.

Geology and ground-water resources of Duval County, Texas, A. N. Sayre (*U. S. Geol. Survey, Water-Supply Paper 776 (1937), pp. VI+116, pls. 8 figs. 3*).—This report presents the results of a study made for the purpose of determining the availability and quality of ground-water supplies in the county and the relation of the ground water to the artesian waters in Brooks, Kleberg, and Willacy Counties.

Public Roads, [May and June 1937] (*U. S. Dept. Agr., Public Roads, 18 (1937), No. 3, pp. [2]+53-67+[1], figs. 7; 4, pp. [2]+69-84+[1], figs. 7*).—These numbers of this periodical contain data on the various highway projects as of April 30, and May 31, 1937, and on State motor-fuel consumption and tax receipts for 1936, and the following articles:

No. 3.—The Effect of Curing Conditions on Strength of Concrete Test Specimens Containing Burnt Clay Aggregates, by W. F. Kellermann (pp. 53–58, 61); and the Oliensis Spot Test Improved, by R. H. Lewis and J. Y. Welborn (pp. 59–61).

No. 4.—The Value of Petrography in Determining the Quality of Rock, by D. G. Runner (pp. 69–74, 77); and Vehicle Speeds on Connecticut Highways, by C. J. Tilden (pp. 75–77).

Curing hay, especially with reference to hay chopped into storage (*[Connecticut] Storrs Sta. Bul. 214 (1937), pp. 17-19*).—Results of seven trials in artificial drying of hay chopped into a small metal silo are briefly noted.

Improved poultry housing and equipment, D. C. Kennard and V. D. Chamberlin (*Ohio Sta. Bimo. Bul. 185 (1937), pp. 65-72, figs. 3*).—This article offers some current ideas and suggestions generally applicable to specific plans for various types of housing and to older houses which may need to be modernized.

[Water and sewage research by the New Jersey Stations] (*New Jersey Stas. Rpt. 1936, pp. 105-110*).—Progress results are briefly presented of studies on the activated sludge process, chemical coagulation of sewage, electrodialysis of trade wastes, odor control of sewage, pathogenic organisms in surface water and sewage, industrial waste treatment, chlorination of sewage and activated sludge, and garbage disposal in sewage.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Storrs Station, 1935–36] (*[Connecticut] Storrs Sta. Bul. 214 (1937), pp. 3-7*).—Preliminary findings in a study of four eastern Connecticut towns are reported (1) as to tendencies since 1931 for the proportion of part-time farms to increase and for specialized farms to become more diversified and (2) as to types of part-time farms operated by newcomers since 1930. Some findings in a study of the marketing of fruits and vegetables in the Hartford, Bridgeport, and Waterbury markets are given as to size of weekly purchases and sources of supplies of stores, methods of selling by farmers, etc. Some preliminary findings and observations are also included in the study of the supply and transportation of milk in the State.

[Investigations in agricultural economics by the New Jersey Stations, 1935–36] (*New Jersey Stas. Rpt. 1936, pp. 18-25*).—Brief summaries are in-

cluded of the findings to date in studies of the costs of producing different farm products and the factors affecting economical production; the trends in types of farming in New Jersey as shown by farm management and organization studies; farm tax delinquency 1928–32, inclusive; the motor truck problem and its relation to marketing; and changes in vegetable and fruit marketing.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 185 (1937), pp. 72–80; 186 (1937), pp. 97–104, 110, 111*).—Included in Bulletin 185 is an article on Farm Business Summaries for 1930 to 1935, by J. I. Falconer and R. M. Isler (pp. 72–79), with a table based on 5,823 farm business records showing by counties by years the average cash receipts, cash operating expenses, cash investment expenses, and labor income per farm, the farms being grouped according to the chief sources of income. Bulletin 186 includes an article on Some Problems in Adjusting Land Use, by J. S. Cutler, A. H. Paschall, and G. W. Conrey (pp. 97–104), discussing the physical and economic factors affecting land use and the readjusting of land use on individual farms, and an article on Some Farm Management Factors Related to Soil Productivity Balance, by F. L. Morison (pp. 110, 111), with a table showing farm practices, yields, labor incomes, etc., in 1936 on 80 Wyandot County farms grouped in 5 groups according to the soil productivity balance maintained. The Index Numbers of Production, Prices, and Income, by Falconer (pp. 80, 112) (E. S. R., 77, p. 123), are brought down through December 1936 and February 1937.

Current Farm Economics, [June 1937] (*Oklahoma Sta., Cur. Farm Econ., 10 (1937), No. 3, pp. 49–62+[2], figs. 7*).—Included in addition to the usual price and purchasing power indexes are articles on Sources of Oklahoma Farm Cash Income, by L. S. Ellis and T. R. Hedges (pp. 51–53); Beef Cattle Situation, The Economic Situation, and The Agricultural Situation, all by T. R. Hedges (pp. 53–56, 60–62); and The Wheat Situation, by R. T. Klemme (pp. 56–60).

[Investigations in agricultural economics by the Wisconsin Station, 1935–36] (*Wisconsin Sta. Bul. 438 (1937), pp. 1–13, fig. 1*).—Included are the findings in studies (1) by B. H. Hibbard of taxes paid by farmers and city and village residents in proportion to their income; (2) by A. Hobson and G. R. Paschal of the significance of foreign trade to Wisconsin farmers; (3) by W. P. Mortenson of the use of fluid and evaporated milk during 1935 and 1936 by 1,029 families in Milwaukee, Kenosha, and Janesville, and the effect of the use of evaporated milk on the price of fluid milk; (4) by P. E. McNall of the effects of diversification on the labor incomes in 1935 of 1,260 farmers, and of the incomes in 1935 of 89 farmers with less than 40 acres of crop land; (5) by M. A. Schaars of the use of truck transportation by cooperative livestock shipping associations; (6) by H. H. Bakken and H. E. Larzelere of the reasons for the decline in the marketing of tobacco through the Northern Wisconsin Cooperative Tobacco Pool; (7) by O. J. Scoville, W. F. Musbach, and G. S. Wehrwein of the savings in public expenditures that would be effected by the relocation of land users not conforming to the zoning plan in Oneida County; and (8) by Hibbard and F. L. Garlock of the experiences of Wisconsin country banks from June 30, 1929, to June 30, 1935, with different types of loans.

Foreign Agriculture, [April and May 1937] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 1 (1937), Nos. 4, pp. 155–206, figs. 3; 5, pp. 207–260, figs. 4*).—Included in No. 4 are articles on Agriculture in Manchuria—Possibilities for Expansion, by W. Ladejinsky (pp. 157–182); and New Zealand Agricultural Policy, by A. T. Murray (pp. 183–200), and notes on German land ownership legislation tightened, France guarantees quality of French wines, new land

tenure law in Colombia, Argentina reduces production of wine grapes, and some recent Soviet decrees affecting agriculture.

No. 5 includes an address by Secretary H. A. Wallace before the National Council of American Importers and Traders, Inc., on An American Policy on Imports (pp. 209–216); an article on Germany's Capacity to Produce Agricultural Products, by N. Jasny (pp. 217–256); and notes on new self-regulation of agriculture planned in the Netherlands, Poland acts to check price advances, and collective contract for farm workers in France.

Rural land economics, 1936: Oustanding references relating to rural land economics, especially to the present national land policy (supplementing rural land economics, 1933–1935), compiled by O. CUMMINGS (*California Sta., 1937, pp. [1]+93*).—This is a supplement to the bibliography previously noted (E. S. R., 75, p. 709).

Economics of agricultural land use adjustments.—I, Methodology in soil conservation and agricultural adjustment research, R. SCHICKELE (*Iowa Sta. Res. Bul. 209 (1937), pp. 337–423, figs. 16*).—This bulletin describes the problems, procedure, and preliminary findings in a project entitled "a study of certain aspects of Corn Belt agriculture in order to determine suitable policy for production reduction", begun in March 1934 by the station in cooperation with the U. S. D. A. Agricultural Adjustment Administration with a view to suggesting desirable crop systems for Iowa that would economically maintain soil fertility and would be consistent with sound farm-management policies. The purpose of the bulletin is "to clarify objectives, evaluate basic assumptions, and interpret such concepts as soil conservation and land-use adjustment in the light of public policy" rather than to recommend solutions to the soil conservation and land-use problems.

The need for planning fundamental adjustments in agricultural production, the proper sphere for economic planning in agriculture, emergency character of the AAA programs, requirements for a long-time program in the Corn Belt, and research projects in agricultural adjustment are described. The characteristics of present farming conditions in Iowa, including present land-use patterns and crop systems, feed unit productivity of crops and pastures, commercial movements of feed grains, and animal units and livestock systems, and the economic problem of soil conservation, including some characteristics of soil erosion and depletion, levels of natural soil fertility, the "breaking point" of natural fertility, regional allocation of emphasis on conservation, methods of soil conservation, and soil conservation and farm income, are discussed. The adjustments in Iowa farming necessary to establish a maintenance agriculture, including adaptation of crop rotations to soil types, adjustments in the crop systems of the type-of-farming areas, effects of adjusted rotation on crop yields, feed production from the adjusted crop system, changes in livestock systems, and economic evaluation of the adjustment problems in the various type-of-farming areas, are also discussed. The objectives and basic assumptions of the regional agricultural adjustment project of the AAA are discussed and its results evaluated.

Types of farming and type of farming areas in Connecticut, I. G. DAVIS (*[Connecticut] Storrs Sta. Bul. 213 (1936), pp. 144, figs. 22, map 1*).—This study was based on 281 schedules obtained in the town of Woodstock in 1929, 1,802 in 11 other towns in the eastern highland section of the State in 1931, and 5,593 in 38 other towns in 1934.

The method of study is described briefly as follows: "In order to penetrate the obscurities created by attempting to describe a heterogeneous agriculture in terms of averages, it was decided to approach the problem of description no

longer from the standpoint of attempting to analyze or break down mass figures, but to approach it from the standpoint of the individual farm. By this method each individual farm would be described realistically in accordance with some uniform pattern or method of description. Similar farms would then be grouped in classes. A description of each class would be made not only in terms of typical farms but with due consideration for the class deviations from the mode. The approach would thus be from individual farms rather than mass statistics and the method would be that of building up groups of similar farms rather than in attempting to analyze totals or averages." With a few minor changes the method of farm classification is similar to that in Bulletin 191 previously noted (E. S. R., 71, p. 265).

"The bulletin contains five main parts: (1) A classification of the farms of Connecticut, showing the count of number of farms by classes and subclasses; (2) a geographic study showing the type of farming areas for the State; (3) a description of the several types of farming found in Connecticut; (4) the utilization of the data of the study as a sample census of Connecticut agriculture; [and] (5) a history of type farming research in the United States and an appraisal of this study with relation to that history."

Types of farming in Utah, M. Clawson, W. U. Fuhriman, G. T. Blanch, and W. P. Thomas (*Utah Sta. Bul. 275 (1936), pp. 98, figs. 15*).—"The specific purposes of this study are: (1) To locate and delineate the major type-of-farming areas of the State; (2) to analyze and describe the major types and some minor types of farming within each area; (3) to indicate the fundamental reasons for the principal differences which exist within and among these type-of-farming areas; and (4) to indicate, in a general way at least, the major problems facing farmers operating each type of farm."

Part 1 discusses the social and economic factors affecting Utah's agriculture, principal physical characteristics of the State, climate, soils, agricultural use of land, size of farm, land tenure, and distribution of types of farms.

The State is divided into four major types-of-farming areas, with four subareas under diversified-irrigated farms and ranches and three minor divisions under specialized livestock ranching. Part 2 analyzes the agricultural organization of each area and discusses the physical, climatic, economic, and social conditions; the relationship of crops, livestock, and range; the distribution of different types of farms, farm organization, etc.

Organization of a successful small farm in central west Tennessee, C. E. Allred, B. D. Raskopf, and D. H. Esbt (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 32 (1937), pp. [1]+II+38, figs. 14*).—This report deals with the organization of a successful 50-acre farm in Crockett County. The data were gathered in a farm organization and soil conservation survey of 150 farms in the county made in 1935. An analysis is made of the extent of the farm business, receipts, expenses, cropping system and soil conservation practices, soil productivity, and efficiency factors of the farm. Comparisons are made with other farms in the survey.

How the Swiss farmers operate on the Cumberland Plateau, C. E. Allred, S. R. Neskaug, and W. E. Hendrix (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 33 (1937), pp. [1]+II+30, figs. 14*).—This is the study of a group of 16 small size but intensively farmed farms in Grundy County. Most of the operators were economically independent during the recent depression, while 72 percent of the population of the county was on the relief rolls at one time or another. The type of farming, farm practices, size of farm business, and farm receipts and expenditures of the group are analyzed and discussed.

Production requirements and costs on irrigated farms in Montana, P. L. SLAGSVOLD and C. HOWARD (*Montana Sta. Bul. 338 (1937), pp. 36*).—"The present study is intended to analyze the principal cost items in irrigated farming in Montana and to furnish basic data for the budget method of planning the farm business." It is based chiefly on farm production studies in Montana and other neighboring States where irrigation is of some consequence. Tables are included showing the machinery requirements with costs, depreciation and repair costs, average use, and average cost per acre for each type of implement for 80- and 160-acre farms in grain and hay and grain, hay, beans, and sugar beets; the average yields of different crops on such farms; the equipment requirements with costs, depreciation and repair costs, and costs per acre for 80- and 160-acre farms, seed and other supplies per acre needed for different crops; feed requirements and acreage equivalents for different kinds of livestock; and the labor and power requirements per acre in the production of sugar beets, alfalfa, small grains, potatoes, beans, and seed peas. Overhead, irrigation, drainage, and other costs are discussed.

Dairy herd organization and income on dairy farms, D. MEADE (*Maryland Sta. Bul. 404 (1936), pp. 207–220*).—Personal interviews were had regarding the organization and operation in 1932 of 90 dairy farms in 5 counties of Maryland, with dairy herds ranging from 9 to 51 head and averaging 22 head. The characteristics of the herds and management practices are described and analyzed.

The labor incomes per farm ranged from —$2,005 to +$2,036, averaging $270. "The most profitable farms produced more milk per farm, made better use of home-grown feeds, produced milk at a lower feed cost per 100, and made more efficient use of labor, resulting in a smaller expense per 100 lb. of milk or per pound of butterfat. Efficiency in production would seem to be more important than size of herd."

Factors indicating poor dairy practices were: (1) Average annual production per cattle unit was 4,500 lb. of milk and 180 lb. butterfat; (2) over 90 percent of the farms kept no records of milk and butterfat production of individual cows; (3) 29 percent of the sires were grades; (4) 85 percent of all pregnancies served only to freshen cows; (5) breeding records were kept on less than 50 percent of the farms; (6) Bang's disease was prevalent; and (7) 87 percent of all farms' cows were not fed a ration balanced in proportion to the productive capacity of the individual cows.

An economic study of dairy farms in Maryland, S. H. DEVAULT and A. B. HAMILTON (*Maryland Sta. Bul. 405 (1936), pp. 221–251, figs. 6*).—Farm management records were obtained from 184 dairy farms in 1931, 180 in 1932, and 176 in 1933. The farms are located in 5 counties where dairying was the chief enterprise and 2 in which dairying was a comparatively new enterprise. The areas and types of farms are described, and the organization and business are discussed and analyzed.

Receipts from milk and dairy stock represented 72.1 percent of the total receipts, poultry 9.7, other stock 1.3, truck crops 6.3, and wheat 5.9 percent. The average labor incomes were $1,379 on the most profitable farms (25 percent), —$849 on the least profitable farms (25 percent), and $222 for all farms. Gross receipts, size of dairy herd, and milk sales per cow were the most important factors affecting profits. The low income farms had larger acreages of grain and hay and smaller acreages of pasture and truck crops. The high income farms had larger yields of crops and received $136 more per farm from poultry, egg sales per hen being 58 ct. higher. The most profitable farms

purchased more feed but had a lower feed cost per unit of production. They also had a higher investment in machinery but expended less for labor.

Recommendations are made in regard to dairy organization and practices.

Cost of producing deciduous fruit trees in selected California nurseries (a progress report), R. L. ADAMS (*California Sta. Mimeogr. Rpt. 58 (1937), pp. [1]+10*).—This is a progress report on the findings in a study of the costs of producing seedlings and budded deciduous trees and the costs of marketing, made for the Deciduous Tree Board of the California Nurserymen's Association. Data were obtained from 15 nurseries producing 2,554,000 seedlings and 13 nurseries producing 2,307,000 dormant bud or second-year trees.

The average costs per tree for all nurseries studied were seedling year 2.5 ct., second year for trees graded as salable 3.6, and marketing 7.1 ct., and for the 10 nurseries for which complete data were obtained, 4.6, 4.2, and 8.7 ct., respectively. Costs varied greatly among nurseries. Discards of trees budded and subsequently graded as salable varied from 12.1 to 64.3 percent, averaging 39.6 percent in the individual nurseries. Trees graded salable but not sold varied from 2.6 to 24.4 percent, averaging 12.8 percent. Size of business had no significant effect on the cost of first-year trees, but the smallest nurseries were at a distinct disadvantage in the production of second-year trees. The cost of retailing trees averaged 7.3 ct. per tree as compared with 3 ct. for trees sold at wholesale.

What are production costs? R. L. ADAMS (*Amer. Nurseryman, 65 (1937), No. 12, pp. 3–5*).—With a few minor modifications, this is a reprint of the report noted above.

Farm tenure in Iowa.—III, The National Farm Institute symposium on land tenure (*Iowa Sta. Bul. 357 (1937), pp. 297–376*).—This third bulletin of the series previously noted (E. S. R., 77, p. 265) includes the following papers presented at the first National Farm Institute, held at Des Moines on February 19 and 20, 1937: What Has Happened to the Agricultural Ladder? by T. W. Schultz (pp. 301–308); The Farm Tenure Situation in the Cotton South, by W. W. Alexander (pp. 309–315); The Upward Spiral in Tenancy and Our Land Policies in Retrospect, by B. H. Hibbard (pp. 316–321); Influence of Business Booms and Depressions on Farm Income, by G. R. Davies (pp. 322–326); State and Federal Responsibilities in Improving Farm Tenure, by E. A. O'Neal (pp. 327–332); State Action on Farm Tenancy, by E. J. Meeman (pp. 333–340); Credit Policies That Will Give Us a Better Agricultural Ladder, by A. S. Goss (pp. 341–354); Farm Tenure From Standpoint of Institutional Owner, by G. S. Nollen (pp. 355–365); Stability for Agriculture, by H. L. Brown (pp. 366–371); and Iowa Farm Tenancy, by N. G. Kraschel (pp. 372–376).

Plantation operations of landlords and tenants in Arkansas, H. W. BLALOCK (*Arkansas Sta. Bul. 339 (1937), pp. 45, figs. 4*).—Information regarding 89 plantations in 9 counties of the State was obtained by interviews with landlords and tenants. The data are for the year 1934.

The average plantation included 1,306 acres, of which 53.4 percent was cultivated, 5.8 percent was idle tillable land, 9.8 percent pasture, 18.7 woodland not pastured, and 12.3 percent waste land. Of the cultivated land, 52.8 percent was occupied by cotton, 28.6 by corn, 10 by legume crops, and 7.8 percent by other hay crops. The landlord cultivated 40.8 percent of the land with wage hands. The average investment per plantation was $71,224, of which 20 percent was borrowed. There was an average of 19 share croppers, 4 other tenants, and 4 wage hands per plantation. Of the credit supplied landlords, 60.3 percent of the long-term and 54.7 percent of the short-term credit was received

from local banks and 25.6 and 33.7 percent, respectively, from the Farm Credit Administration. The average gross cash income per plantation was $10,774 and the net cash income $4,503, or 8 percent on the investment.

Cropper farms averaged 16.3 acres, of which 12.3 acres were in cotton and 3.8 acres in corn. Share tenant farms averaged 29.1 acres, with 17.9 acres in cotton and 9.9 acres in corn. The average net incomes per family were share croppers $284, other tenants $425, and wage hands $203. Croppers produced and consumed $67 worth of products and share tenants $131 worth.

The plantation commissary, length of tenure of and social contributions of landlords to tenants and wage hands, and the production of food for home use are discussed.

Some of the findings and recommendations were: In view of improved methods of farming and modern tools and machinery, tenant farms on the average should be larger; better results would probably be obtained in the production and preservation of foods if the work was done cooperatively rather than individually as at present; and because of low wage scales the use of better tools, equipment, and farming methods, and the flexibility in use of productive agents, the wage crop method in most situations gives the landlord better financial results than the tenant system.

"If the tenant system is continued, both the landlord and tenant would benefit by utilizing better tools, equipment, and machines on all acres. This would be made easier (1) if the tenant farms were larger to facilitate the use of improved farming methods and to keep the tenant's time more fully occupied, and (2) if provision were made for wage labor to assist tenant families during periods when the family labor is insufficient to hoe and pick the cotton."

In view of the relatively high rate of interest paid, the low return on investment, and the fact that interest payments take 27.1 percent of the net cash income, planters should provide more of their capital themselves. Longer term contracts with other provisions that would minimize the frequent shifting of tenants should be put into use.

Farm tenancy: Report of the President's Committee (*Washington: Govt., 1937, pp. VIII+108, pls. 9, figs. 5*).—This includes a report of the President's Committee, including findings and recommendations; a technical supplement dealing with farm tenancy in the United States, problems associated with tenancy, and some tenure programs of other nations; and a statistical supplement.

Cooperative marketing of sweet potatoes in Tennessee, C. E. Allred and B. H. Luebke (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 34 (1937), pp. [1]+III+41, figs. 7*).—"The purpose of this report is to summarize the attempts made by Tennessee farmers and businessmen to handle their sweetpotatoes cooperatively from 1913 to 1930. An account of their failures, as well as their accomplishments, is given for the benefit of those who may wish to profit by the experience of others in this type of endeavor." The problems of sweetpotato marketing in Tennessee, the trend and geographical distribution, organization and method of financing, and functions attempted by and accomplishments of cooperative sweetpotato marketing associations in the State are discussed.

The authors found that the cooperative associations have rendered service by promoting commercial production of sweetpotatoes in sections adapted to that crop, providing storage where production was not sufficient to attract private commercial storage, making possible the assembling of the lots of small growers into carloads, and improving grading. Important causes of the failure of the associations were found to be overpromotion, small volume of business,

high annual cost in order to retire storage house indebtedness, insufficient operating capital, inefficient management, and competition of local markets.

Economic considerations in fixing resale prices of milk, J. M. Tinley (*California Sta. Mimeogr. Rpt. 57 (1937), pp. [1]+9*).—This is a paper presented as testimony at a hearing held at Sacramento on March 24, 1937, to consider a bill to provide for enforcement of minimum wholesale and retail prices of market milk and market cream.

Regional differences in farm price of corn, Tennessee and United States, C. E. Allred, P. T. Sant, and C. M. Smith (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 31 (1937), pp. [1]+IV+38, figs. 17*).—This preliminary report includes and discusses tables, charts, and maps showing the average annual prices of corn in the United States by States, 1910–34 and 1930–34, and the average prices by counties of Tennessee, 1910–14 and from November 1929 to October 1935. Some data are included on regional variations in the prices of corn in other States. The effects of surplus and deficit production, transportation costs, production per corn-consuming livestock unit, productivity index, human consumption of corn, and other factors on regional prices of corn are discussed briefly.

Cotton prices in relation to cotton classification service and to quality improvement, L. D. Howell and J. F. Hembree (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. 42, figs. 7*).—This report is based on data collected in 24 selected local markets distributed throughout the Cotton Belt in 1933–34, 7 selected local markets in Texas in 1934–35, and 3 local markets in Texas in 1935–36. The markets included some in which there was little, if any, classification of the cotton before or at the time of sale by the growers, some in which more or less classification was made by the local buyers prior to sale by growers, and one in which sales were on the basis of classification of public classers licensed by the Secretary of Agriculture. The data are analyzed to show the grade and staple premiums and discounts reflected in prices paid to growers in the different groups of markets. The relation between average prices and average grade and staple length from market to market and from one period to another, the factors affecting grade and staple premiums and discounts, the influence of prices to growers on quality of cotton produced, and means of making desirable adjustments in the quality of cotton produced are discussed.

In 1934–35 about 18 percent of the central-market premiums for grades above middling and 59 percent of the discounts for grades below middling were reflected in the prices paid to growers in the markets without a classification service, and 85 and 128 percent, respectively, were reflected in the markets with classification service. The percentages of premiums and discounts for staple length were 7 and 47 percent, respectively, in the two types of markets. Grade and staple premiums and discounts to growers on the basis of the local buyers' classification averaged about 65 percent of those quoted in the central markets.

Average prices in different local markets reflected fairly accurately the differences in average quality of the cotton offered, so that the production of the higher grades and longer staples was generally rewarded on a community basis.

Statistical analysis of the annual average f. o. b. prices of canned clingstone peaches, 1924–25 to 1936–37, H. R. Wellman (*California Sta. Mimeogr. Rpt. 59 (1937), pp. [1]+7, fig. 1*).—Analyses are made of the average relations between f. o. b. prices of canned clingstone peaches and (1) total shipments of California canned peaches, (2) index of urban consumer's income in the United States, and (3) adjusted index of prices of canned fruits competing with canned peaches.

On the average a change of one million cases in total shipments of canned peaches was accompanied by a change in the opposite direction of 16 ct. a case in the average f. o. b. price of canned clingstone peaches; a change of 10 points in the index of urban consumers' income was accompanied by a change in the same direction of 45 ct. a case; and a change of 10 points in the adjusted index of prices of competing canned fruits was accompanied by a change in the same direction of 20 ct. a case.

Crops and Markets, [April–May 1937] (*U. S. Dept. Agr., Crops and Markets, 14 (1937), Nos. 4, pp. 69–88, figs. 2; 5, pp. 89–108, fig. 1*).—In addition to the usual crop and livestock production reports and market reports, seasonal reports are included in No. 4 on cattle on feed, condition of important crops, farm labor supply and demand, farm real estate values, farm wage rates and index numbers, and grain stocks on farms April 1; and in No. 5 on condition of important crops, maple products, sugar beets and beet sugar, sugarcane, sugar, sirup, and molasses, tobacco, truck crops (acreage and production forecast), and wheat in interior mills, elevators, and warehouses April 1.

RURAL SOCIOLOGY

Some characteristics of rural families in three Michigan communities, C. R. Hoffer (*Michigan Sta. Spec. Bul. 283 (1937), pp. 22*).—This study, comprising an analysis of data for 741 rural families in three selected communities in the State, showed that approximately two-fifths of the number had from one to two children, while 134 families had no children at all and 8 percent had six or more children.

In most instances the size of the houses appeared to be ample. Nearly two-thirds of the total number had seven or more rooms. The average number of rooms per person for the 527 rural farm families was 1.9 and for rural nonfarm (town) families 2.1.

In these families only about one-fourth of the husbands and one-third of the wives had attended high school.

The ways in which the leisure time of these families while at home was spent varied, although reading and listening to the radio occupied a large proportion of it. Three-fifths of these families had memberships in a church and one-half were represented in fraternal organizations.

Rural women and the Works Progress program: A partial analysis of levels of living, E. L. Morgan, J. D. Ensminger, and M. W. Sneed (*Missouri Sta. Res. Bul. 253 (1937), pp. 29, figs. 9*).—The data comprise records of 553 rural women in Works Progress Administration sewing rooms in 12 selected counties in the State. Two-thirds of the women were born on farms and an additional 20.6 percent were born in villages having less than 2,500 population. Their ages range from 15 to 78, with a median age of 41.5 yr. About one-fourth now reside on farms, while the others live in villages and towns. The residential distribution is thought to be in part a function of the location of workrooms and in part the result of rural-urban migration.

All but seven of the women indicated that they were the principal economic heads of their respective families. The average length of time served as the economic head was 4.2 yr. Family income other than WPA wages averaged $9.79 per month and was indicated by one-fourth of the women. There was an average of approximately three persons whose support was dependent upon these women. Only 6.7 percent had no dependents, but nearly one-third had no more than one.

It was indicated that 40.2 percent of the women had previously worked outside the home before they obtained employment under the work relief programs.

Work experience or skill was reported largely in the domestic and personal service occupations, with sewing most frequently reported.

Relation of size of community to marital status, D. SANDERSON (*[New York] Cornell Sta. Mem. 200 (1937), pp. 74, figs. 32*).—This study indicates that the proportion of persons 15 yr. of age or over who are married tends to decrease with the size of the community, while the proportion of persons who are single increases with the size of the community. The age at marriage, in the case of white persons, tends to increase with the size of the community for all classes except males on farms and in suburban cities of from 25,000 to 50,000 population. The proportion of broken homes, whether the result of divorce or of widowhood, also increases with the size of the community. The phenomena of marital status in incorporated villages are much more like those in small cities than those for the rural farm or nonfarm population.

Losses and gains of outstanding leaders in Tennessee, C. E. ALLRED and W. E. HENDRIX (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 36 (1937), pp. [1]+II+21, figs. 10*).—Natives of the State listed in Who's Who in America for 1930–31 number 507, or 3.29 persons for each 10,000 population in *1880*. "*This is lower than the average of the United States but higher than* most Southern States." Those listed as born in Tennessee now live in 42 States, and 413 names are listed as living in the State, a net loss of 94 persons. The listings have come from 84 counties of the State. The State has suffered net losses of talent in all except 4 of the 13 occupational groups—educators, religious workers, natural scientists, and engineers.

Chinese rice farmers in Hawaii, J. W. COULTER and C. K. CHUN (*Hawaii Univ., Res. Pubs. No. 16 (1937), pp. 72, figs. 15*).—A historical statement concerning the Chinese rice farmers in Hawaii, including their agricultural operations and social and religious institutions.

Rural families on relief in Connecticut, N. L. WHETTEN, H. D. DARLING, W. C. MCKAIN, and R. F. FIELD (*[Connecticut] Storrs Sta. Bul. 215 (1937), pp. 76, figs. 8*).—This report is the result of a cooperative study between the Federal Emergency Relief Administration and the station. It is a description of the relief population in 38 Connecticut townships, each with a population of less than 5,000, and distributed throughout the State to represent a sample of the rural population. The study is based upon 1,683 families, containing 6,057 members, who were on relief at some time during the period from February to December 1935. The information was collected every month from the local administrators of relief in each of the townships.

***Some factors affecting social welfare in rural areas of Alexander County,* Illinois, 1934,** D. E. LINDSTROM (*[Chicago]: Ill. Emergency Relief Comn., 1937, pp. [2]+45, figs. 21*).—In summarizing this study of Alexander County, made in cooperation with the Illinois Experiment Station, the following conditions stand out as being important and related to one another:

Although high hopes had been held in the early years of the development of the county for unusual growth and prosperity, on account of its location and resources, the total population, which included a high percentage of Negroes, had steadily declined during the last two decades. The rural population, on the other hand, had tended to increase slowly, particularly in the open-country areas. Approximately 51 percent of the total population were on relief in July 1934 and 40.4 percent in November 1934, when this study was made. About two-thirds of the land used for agricultural purposes was not producing properly, one-third needing better drainage and more efficient methods of farming, and the other third being cut-over forest land which should be returned to forests. The relief rates in these two areas were particularly high. Both business and

social conditions in the rural areas of the county were very poor. A great many projects were suggested as suitable for work relief, most of them being such practical types as improving roads, drainage, and school buildings.

Texas unemployable cases in the rural and town relief population, January 1936, W. C. Holley (*[Austin]: Tex. Relief Comn., 1936, Rpt. 1, pp. [34], figs. 10*).—This report, made in cooperation with the Texas Experiment Station, presents an analysis of the unemployable case head data from a 100-percent sample of schedules. Of all heads surveyed, 89.5 percent were reported as handicapped by some type of disability.

Education of heads and children in the Texas rural and town relief population, October 1935 (28 sample counties).—Preliminary report, W. C. Holley and C. E. Ullrich (*[Austin]: Tex. Relief Comn., 1936, Rpt. 2, pp. [4]+13, fig. 1*).—Almost 18 percent of the heads of relief households had either never attended or never completed the first grade in school. Three out of 10 relief heads had completed only from 1 to 4 yr. in grade school. Less than 10 percent of all relief heads had completed grade school, less than 3 percent had completed high school and less than one-half of 1 percent had graduated from college. Children living in villages received more schooling than those living in the open country and in towns. The educational attainments of heads residing in towns were below those of heads living in the open country and villages. The study was in cooperation with the Texas Experiment Station.

The farm operator in the Texas rural and town relief population, October 1935 (28 sample counties).—Preliminary report, C. E. Ullrich (*[Austin]: Tex. Relief Comn., 1936, Rpt., 3, pp. [45], figs. 8*).—More than one-half of the tenants and croppers studied were between 25 and 45 yr. of age, and more than 40 percent of the owners were between the ages of 45 and 65 yr. The most prevalent family size group of farm operator households was that of 4 to 6 members, with 212 families recorded, followed by the 1 to 3 members group, with 159 families. White farm operators had received considerably more formal schooling than other races. A small percentage of white farm operators led other races for sustained receipt of relief. In the aggregate, however, Negroes had been retained on relief rolls for longer periods than either whites or Mexicans. Also, Negroes received more material aid during the one month of this study than whites in every family size group but one, that of 7 to 10 members. Mexicans had been on relief rolls a shorter time and received far less relief per family member in October than whites and Negroes. Nearly 80 percent of all heads had been engaged in agriculture for 7 or more of the last 10 yr.

The study was in cooperation with the Texas Experiment Station.

The youth in the Texas rural and town relief population, October 1935 (28 sample counties).—Preliminary report, C. E. Ullrich (*[Austin]: Tex. Relief Comn., 1936, Rpt. 4, pp. III+22, figs. 6*).—Out of 1,367 persons from 16 to 24 yr. of age in sample cases in the Texas rural and town relief population of October 1935, 556 were males and 811 were females. Fifteen percent of the white youths in the open country were heads of households, and 10.7 and 8.3 percent of the whites in villages and towns, respectively, were heads of households. Four out of five males and one out of every three females were either working or seeking work in October. Others were not eligible for employment because of school attendance, household duties, or physical disabilities. More than 12 percent of the group working or seeking work had no "usual" occupation.

The study was in cooperation with the Texas Experiment Station.

A study of family heads and other members in the Texas rural and town relief population, October 1935 (28 sample counties).—Preliminary report, C. E. Ullrich (*[Austin]: Tex. Relief Comn., 1936, Rpt. 5, pp. IV+23, figs. 3*).—More than one-third of the heads of Texas rural and town relief households as of October 1935 were farm laborers and unskilled workers whose income was dependent upon periodic labor on the farm and in small communities. Negro relief families were more seriously handicapped by a lack of working members than were whites and Mexicans, having a high percentage of households with no employable members whatsoever and of households with only a single female worker each. As a general rule, the youthful members had received more schooling than members in the older age groups, while the superior educational advantages of whites over Negroes and Negroes over Mexicans were equally obvious. Farm workers required less relief than other workers, according to the number of months of assistance granted to each type.

The study was in cooperation with the Texas Experiment Station.

Fewer rural households on relief, G. W. Hill (*Wisconsin Sta. Bul. 438 (1937), pp. 13–15*).—A study of the rural relief situation in the State, conducted in cooperation with the Works Progress Administration, is reported. The data presented include occupations, reasons for relief, types of households, employment records, and reasons for leaving relief rolls in 1935.

Rural community buildings, D. E. Lindstrom, W. A. Foster, and M. G. Fuller (*Illinois Sta. Circ. 470 (1937), pp. 58, figs. 29*).—This report deals with planning new types of community buildings, community needs, cost of buildings, financing construction and maintenance, control of community buildings, and articles of incorporation, constitution, and by-laws. A number of such buildings are illustrated and described.

FOODS—HUMAN NUTRITION

Food and the principles of dietetics, R. Hutchison and V. H. Mottram (*London: Edward Arnold & Co., 1936, 8 ed., pp. XXVII+634, pls. 3, figs. 32*).—In this edition of this well-known volume, earlier editions of which have been noted (E. S. R., 70, p. 270), the material contained in the first three chapters on the nature, nutritive constituents, and relative values of foods; the amount of food required in health; and the influence of various conditions upon the food requirements has been revised with the help of H. K. Evans. Minor additions and alterations have been made throughout the whole book.

Dietetics simplified: The use of foods in health and disease, L. J. Bogert and M. T. Porter (*New York: Macmillan Co., 1937, pp. IX+637, figs. [77]*).—The major portion of this book, dealing with the use of foods in health and disease, is written by Bogert, and includes a brief discussion of qualitative and quantitative nutritive requirements, a rather full treatment of diet for normal conditions including family dietaries, and a nontechnical presentation of diets for diseased conditions. Therapeutic diets are considered as variations based on the normal diet. Separate chapters are devoted to food allergy, diets at different cost levels, and the adaptation of food to racial groups. In the treatment of diet and disease, each disease is presented along with other conditions which require diets of a similar nature rather than as a separate entity.

Porter has planned 30 laboratory lessons which are correlated with a similar number of chapters in the general text. The first 15 lessons deal with the cookery and service of different classes of foods, ranging from beverages and

cereals to infant formulas and moderate- and low-cost meals. The remainder consists of planning diets for normal and diseased conditions, together with the menu building and cookery required for carrying out such diet projects. The nutritive value of foods, weights and measures, and weight tables are contained in the appendix.

[Studies in foods and nutrition by the Wisconsin Station] (*Wisconsin Sta. Bul. 438 (1937), pp. 130, 131, 133–144, 146, 147, fig. 1*).—Included in this progress report are summaries of studies, several of which represent extensions of earlier work (E. S. R., 75, p. 564), by M. Johnson, H. Steenbock, and H. T. Parsons on the nutritive value of the proteins in raw and heated soybeans (pp. 130, 131); by E. Lease and J. H. Weber in cooperation with Steenbock on the effects of rancidity on vitamin A in fats (p. 133); by A. Arnold, C. A. Elvehjem, and E. B. Hart on the nature of the growth factor in liver (pp. 133, 134); by O. L. Kline, H. R. Bird, Elvehjem, and Hart on an improved ration for vitamin B_4 studies and the distribution of this vitamin in foods (pp. 134, 135); by W. C. Sherman and Elvehjem on the relation of vitamin B_1 to pyruvic acid metabolism (pp. 135, 136); by E. L. Hove, Elvehjem, and Hart on the function of zinc in the animal body (p. 136); by D. R. Borgen and Elvehjem, with the cooperation of K. B. McDonough and J. E. Gonce, on the question of a relationship between anemia and rickets (pp. 136, 137); by G. O. Kohler, Elvehjem, and Hart on the available iron in foods (pp. 137, 138); by M. O. Schultze, Elvehjem, and Hart on the relation of the copper content of the blood to hemoglobin formation and by Elvehjem, D. Duckles, and D. R. Mendenhall on the need of copper as a supplement to iron for the treatment of anemia in children (pp. 138, 139); by E. C. Van Donk, J. Semb, and Steenbock on sex differences in the storage of iron (pp. 139, 140); by H. H. Schneider and Steenbock on factors causing tetany (p. 140); by J. T. Lowe and Steenbock on the role of cereals in bone formation (pp. 140, 141); by P. H. Phillips and Hart on the use of aluminum salts to combat the effects of fluorine in the diet, and by Phillips on the effect of sodium fluoride on toxic goiter (pp. 141, 142); by J. Lease, Parsons, E. Kelly, L. Almon, and W. D. Stovall on egg white injury (pp. 142–144); by W. H. Peterson, Elvehjem, and P. Pavcek on factors influencing the vitamin B content of yeast (pp. 146, 147); and by Peterson, Steenbock, E. B. Fred, E. A. Prill, J. Berger, and D. W. Woolley on protein deficiencies of mold tissue (p. 147).

Experimental baking pans, C. F. Davis, L. E. Leatherock, and H. W. Putnam (*Cereal Chem., 13 (1936), No. 1, pp. 113–118*).—In this committee report, the 16 collaborators compared the tall- and low-form pans recommended for use in the official A. A. C. C. baking test procedure. Following preliminary tests, the dimensions of the low-form pans were changed to give the sides nearly the same pitch as the tall-form pan. This modified pan gave a definite increase in loaf volume and a product that more nearly resembled the commercial loaf in symmetry and proportion.

Report of the 1934–35 Pie Flour Committee, C. B. Kress et al. (*Cereal Chem., 13 (1936), No. 1, pp. 104–112, fig. 1*).—The committee made collaborative studies on 10 flour samples, which included baking tests using an artificial fruit filling of known acidity and a peach filling. It is recommended that in further investigations the test procedure should include pie with a filling such as the peach to determine shrinkage, toughness, and soaking of the crusts, the A. A. C. C. baking test with 3-hr. fermentation time, and viscosity comparisons to determine flour characteristics. Soft wheat flour of medium low viscosity gave the best test product.

Effect of stage of maturity of the snap bean on its composition and use as a food product, C. W. CULPEPPER (*Food Res., 1 (1936), No. 4, pp. 357–376, figs. 4*).—In this contribution from the U. S. D. A. Bureau of Plant Industry, the entire bean, the hulls, and the seeds of Burpee Stringless Green Pod snap bean were analyzed at 5- or 10-day intervals from flowering until the beans were almost completely mature. The total solids in the entire bean decreased from the 5- to 10-day stage, then increased gradually to about the 20-day, and more rapidly to the 40-day stage. The hulls were low, with small changes, and the seeds high, with great changes in total solids during development. The sugar content was rather low, largely sucrose in the seed and reducing sugar in the hull, and in the entire bean rose to the 15- or 20-day stage and then decreased to the 40-day stage. The total nitrogen was high in the seed, low in the hull, and in the entire bean decreased slightly from the 5- to the 10-day stage and then increased slowly to about the 20-day stage, when a rapid rise occurred as a result of changes in the seed. The hull contained a small amount of nitrate, with none present in the seed. The tanninlike materials were higher in the seed than in the hull, with a rapid decrease in the seed content.

Cooking tests showed the 20- to 25-day-old beans to be best for table use, with an acceptable product in beans picked from the 10- to the 25-day stages. Canning tests with the same variety and Refugee Wax indicated that the best stage for canning was when the pods were 15 days old, with a fairly acceptable canned product possible from about the 10- to 20-day stage. The resistance to pressure appeared to be a little higher at the 5-day than at the 10-day stage, with a continued increase noted up to the 40-day stage, when it reached a point beyond the range of the pressure tester used. This resistance to pressure was very closely correlated with the percentage of insoluble solids present.

Dried egg-white, A. K. BALLS and T. L. SWENSON (*Food Res., 1 (1936), No. 4, pp. 319–324*).—In this contribution from the U. S. D. A. Bureau of Chemistry and Soils a new commercial method is proposed for the preparation of dried egg white by acceleration of the enzymic decomposition in the presence of trypsin. The results of whipping and baking tests in which the enzyme-prepared egg white was compared with dried fermented egg white in sample angel food cakes were in favor of the enzyme-prepared product. The advantages of this new product are high sugar content, freedom from bacteria, and in general a closer resemblance to fresh egg white, together with the ease of preparation and saving of time.

Isolation and identification of an anaerobic organism producing gas in boiled beef, L. S. MCCLUNG and E. WHEATON (*Food Res., 1 (1936), No. 4, pp. 307–318*).—The identification of the anaerobic gas bacillus *Clostridium welchii* present in raw meat as the cause of swells in a pack of commercially canned "roast" beef is recorded. The organism was not destroyed during the parboiling process at a temperature of approximately 100°–110° C., and the production of gas during delay in the canning procedure caused the swelling of the cans. All cells were killed during processing so that the condition did not constitute a public health hazard. The toxin is not effective when administered orally.

The home canning of fishery products, N. D. JARVIS and F. P. GRIFFITHS (*U. S. Dept. Com., Bur. Fisheries, Invest. Rpt., 2 (1936), No. 34, pp. II+16, figs. 5*).—In this report new and improved procedures for the home canning of fish are presented. The use of the pressure cooker and of containers not larger than the No. 2 can and the pint glass wide-mouth jar, with composition gasket, is recommended. Recipes for fish dishes and sauces are included.

Microbiological studies of frozen pack berries, with special reference to effects of carbonation, J. A. BERRY (*Amer. Soc. Hort. Sci. Proc.*, *32* (*1935*), *pp. 224–226, fig. 1*).—In this contribution from the U. S. D. A. Bureau of Plant Industry, further tests were made to determine whether there is a more rapid destruction of the micro-organisms present in frozen pack berries at 15° than at −5° F., as reported in a previous study (E. S. R., 71, p. 560). The effect of adding carbon dioxide was studied, and tests were made to determine the keeping quality of the berries at temperatures above freezing after a period of freezing storage. Marshall strawberries, Cuthbert raspberries, and Evergreen blackberries were packed in No. 2 lacquered cans, 13 oz. of fruit and 5 fluid oz. of 50° Brix sirup per can. At the time of sealing, one-half of the cans were carbonated by the addition of about 0.5 g of solid carbon dioxide. Storage temperatures were −5° and 15° F. for the strawberries and −5° and 20° for the other berries.

Bacteriological examination of both carbonated and uncarbonated cans during storage showed that the destructive effect of 15° for 3 mo. was about equal to that of −5° storage for 12 mo. After 5 mo. of freezing storage yeast activity was noted in from 2 to 3 weeks in strawberries held at 70° and in from 7 to 14 days in raspberries and blackberries held at the same temperature. The presence of carbon dioxide failed to retard yeast growth. In airtight samples held at 40° in a household refrigerator after about 5 mo. of freezing storage the quality was maintained fairly well for about 4 weeks, with no increase in bacterial count, although a certain loss in texture occurred, particularly in the strawberries.

The physiology of nutritional requirements, A. M. BUTLER (*Jour. Amer. Dietet. Assoc.*, *12* (*1936*), *No. 1, pp. 23–33, figs. 3*).—The author reviews the present state of our knowledge and outlines the manner in which nutritional requirements may be met. Food substances are divided into those that supply the energy requirements of the body and those that supply the structural requirements. A chart is presented showing the individual factors with their chemical structures, fatty acids and hexoses in the energy group and amino acids, vitamins, inorganic elements, and water in the structure group. To determine whether the diet is nutritionally adequate, a method of planning a formula which will be comparable to mother's milk for the artificially fed infant is used as an illustration. The psychological and physiological reactions of the patient to the diet are important and must be considered by the dietition.

Food consumption of Wisconsin relief families, M. L. COWLES (*Wisconsin Sta. Stencil Bul., 1937, Feb., pp. 27, figs. 4; abs. in Wisconsin Sta. Bul. 438* (*1937*), *pp. 15–17*).—A 2 weeks' study of the food consumption of 36 work relief, 31 commodity relief, and 36 nonrelief families in the land purchase area of Forest County, Wis., was made during the spring and early summer of 1935 for the purpose of comparing the character, costs, and adequacy of the dietaries of the commodity and work relief families with each other and with the dietaries of families in the same section not on relief rolls. The study also afforded an opportunity to compare the managerial skill of the families in the three groups and the extent to which purchased food was supplemented with home-produced.

The money values of the food consumed during the 2 weeks, including food furnished by the home garden or farm and valued at retail prices, were $21.01 per household in the work relief group (paid in cash), $16.78 in the commodity relief (paid in grocery orders), and $20.21 in the nonrelief group. The proportions of total food costs furnished by the home garden or farm

were 41.6, 40.2, and 47.4 percent, respectively. Calculated in terms per adult male unit per day, the food costs for the work relief group, 28 ct., and the commodity relief group, 23 ct., were quite close to the cost per adult male of the adequate diet at minimum cost of Stiebeling and Ward, 26 ct., when adjusted to the same food price level. The cost of the diets of the nonrelief group, 30 ct. per adult male unit, although higher, did not approximate the Stiebeling and Ward figure, 42 ct. adjusted level, for an adequate diet at moderate cost. The distribution of the money costs among the different foods in the three groups showed considerable conformity with Stiebeling's suggested division to secure adequacy at moderate cost.

When judged on the basis of adequacy alone, the work relief diets ranked highest and the nonrelief diets lowest. The low average shown by the nonrelief diets is attributed partly to the fact that many nonrelief families were trying desperately to economize in order to keep off the relief rolls. Poor planning in the distribution of commodities is given as the chief cause of the inadequacy of the diets of the commodity relief group. In both relief groups there was little indication of any relationship between the size of the household and the degree of adequacy of the diet, probably because of the adjustments of food or money to the size of the family in the relief administration, but in the nonrelief families the inadequacies increased with the size of the family.

In general the adequacy of the diets was closely related to the total value or cost of the food consumed. Families whose diets were adequate in all of the nutrients studied were fed at a cost of from 32 to 38 ct. per adult male per day as compared with from 17 to 23 ct. per day for diets deficient in four or more nutrients. The higher cost diets, however, were well in excess of adequacy for all of the nutrients determined, showing that with better management fully adequate diets could have been secured at a lower cost.

In the final evaluation of the data from the standpoint of relief administration, the author concludes that "even a well planned and administered relief dietary may go wide of its mark of achieving nutritional adequacy if the family is lacking in the knowledge and skill necessary to administer it in the home. . . . Not only is emphasis needed on planning ahead for the spending of the food money in the market but on budgeting and planning for raising and home preservation of food at home. . . . Especial care and attention in securing dietary adequacy apparently should be given the families large in size. . . . Considerable leeway as to cost will have to be allowed in any diet having free choice rather than a controlled issuance in food. . . . Direct issuance of food has a considerable value, in addition to an advantage in cost, in lifting up food consumption to a certain minimum standard."

Metabolic studies of Eskimos in the Canadian Eastern Arctic, I. M. Rabinowitch and F. C. Smith (*Jour. Nutr., 12 (1936), No. 4, pp. 337–356*).—Blood and urine analyses, respiratory quotient determinations, and metabolism studies were made on 46 Eskimos living in the Canadian Eastern Arctic region.

The average concentrations of nonprotein nitrogenous constituents of the blood were found to be higher than in other races. Although the chloride concentrations in the plasma of 34 subjects were high, the urine chlorides were extremely low. None of the urines collected contained glucose or acetones. The absence of glucose is in accord with the reported absence of diabetes among the Eskimos. Tests indicated that the Eskimos were unable to utilize large quantities of glucose when given in pure form. Respiratory quotients lower than 0.7 were found in 5 of 10 Eskimos in the fasting state and in 3 of 8 tests in 2 individuals after the administration of fat meals. The basal

metabolic rates were found to be high, the average of 10 subjects being +26 percent in terms of the Du Bois standard. According to the spectrographic examinations, the urines contained relatively large quantities of magnesium, normal quantities of copper, and no lead.

These findings are discussed in the light of the dietary habits and customs of the Eskimos in this region. The rarity of rickets among these people appears to be due to the long periods during which the infants are breast-fed and the fact that the vitamin D content of seal oil is said to be equal to that of the best cod-liver oil.

The basal metabolism of Chinese in Szechwan, L. G. Kilborn and F. G. Benedict (*Chin. Jour. Physiol., 11 (1937), No. 1, pp. 107–126*).—The basal metabolic rates of 54 Chinese males and 14 females varying in age from 17 to 58 yr. and 5 Anglo-Saxon males and 21 females varying in age from 15 to 60 yr. were determined with the Benedict field metabolism apparatus. All the subjects were living at an altitude of approximately 1,600 ft. The nutritional status was in general normal. The following average percentage deviations from prediction standards were obtained: Chinese males, +1.9 from the Harris-Benedict and −2.4 from the Aub and Du Bois; Chinese females, −3.7 and −3.3; Anglo-Saxon males, −0.3 and −5.8; and Anglo-Saxon females, +1.8 from the Harris-Benedict and −3.1 from the Aub and Du Bois. These results indicate that the Chinese of Szechwan possess a basal metabolic rate differing very little from that of westerners living in the same region.

The basal metabolism of the Miao race of Kweichow, L. G. Kilborn and F. G. Benedict (*Chin. Jour. Physiol., 11 (1937), No. 1, pp. 127–134*).—The basal metabolic rates of 23 male Hwa Miao and 1 male Chwan Miao living at an altitude of about 7,000 ft. were determined with a Benedict field metabolism apparatus. The average age of the subjects was 32 yr. The average deviation from the Harris-Benedict standard was +15.8 percent and from the Aub and Du Bois +9.2 percent, with an average pulse rate of 55 per minute. It is concluded that the Miao race is characterized by a relatively high basal metabolic rate.

The state of nutrition of school children in south India, I, W. R. Aykroyd and K. Rajagopal (*Indian Jour. Med. Res., 24 (1936), No. 2, pp. 419–437, pl. 1, figs. 4*).—In this investigation approximately 2,000 school children, aged from 6 to 17 yr. and living in three south Indian towns, were weighed, measured, and examined for symptoms of xerophthalmia, "angular stomatitis", and phrynoderma. The A. C. H. index (A=arm, C=chest, H=hip) of nutrition, as described by Franzen (E. S. R., 71, p. 878) and Palmer was applied to 1,145 children of the group aged from 6 to 12 yr. The height and weight averages for boys aged from 6 to 15 yr. were compared graphically with those of other groups of Indian, Ceylonese, British, and American boys.

The diets of the children were composed largely of milled rice with small quantities of vegetables. Malnutrition due to diet deficiencies was very prevalent, symptoms of food deficiency diseases being found in 14 percent of the cases, while 6.4 percent showed phrynoderma, 9.2 angular stomatitis, and 3.8 Bitot's spots. A group of 25.7 percent was selected by the A. C. H. index as compared with a 10-percent selection for American children. It is suggested that the index needs adjustment for application to Indian children. The Indian boys of a given height weighed very much less than British or American boys of the same height.

The copper content of some human and animal tissues, P. F. Hahn and E. Fairman (*Jour. Biol. Chem., 113 (1936), No. 1, pp. 161–165*).—The chromo-

tropic acid method described by Ansbacher et al. (E. S. R., 66, p. 505) was followed in determining the copper content of fresh tissues from 14 humans and from 4 normal and 9 anemic dogs.

The amount of copper present in the human liver varied from 3.3 mg in a patient with myeloid leucemia to 15 mg per kilogram of fresh tissue in a 7-year-old child with Mediterranean anemia. The splenic copper content of 4 subjects varied from 1 to 2.9 mg per kilogram of fresh tissue. The copper content of the fetal and infant livers varied from 34 mg in a 9-week infant with pneumonia to 78 mg in a 5-mo. fetus born prematurely.

The copper content of the livers of anemic dogs receiving iron administration varied from 15 to 61 mg, and the spleen content varied from 5 to 26 mg per kilogram of fresh tissue. It was noted that as the iron store in the spleen was depleted the copper store increased. The same tendency, but to a less degree, was noted in the anemic dog liver.

Studies on magnesium deficiency in animals.—VII, The effects of magnesium deprivation, with a superimposed calcium deficiency, on the animal body, as revealed by symptomatology and blood changes, H. G. DAY, H. D. KRUSE, and E. V. McCOLLUM (*Jour. Biol. Chem., 112 (1935), No. 1, pp. 337–359, figs. 2*).—In this continuation of the series (E. S. R., 72, p. 876), a deficiency of calcium in the diet of young dogs was superimposed upon a magnesium deficiency by altering the salt composition of the diet to contain approximately 0.002 percent of calcium and 0.0002 percent of magnesium as compared with approximately 0.61 percent of calcium and 0.054 percent of magnesium in the control diet.

The symptomatology and blood chemical changes appeared to resemble those of low calcium rather than low magnesium alone and are summarized as follows:

"The dietary deficiency is manifested by edema, gastrointestinal disturbance with alternate constipation and diarrhea, osteoporosis with consequent deformation of the bones, in a few cases of hyperirritability of the nervous system, which led to fatal convulsions, but in the majority of cases by a marked inertness, and anorexia which usually led to death by consequent inanition. The blood chemical data, obtained by weekly analysis throughout the survival period, reveal an immediate decrease in serum magnesium quantitatively similar to that which induces tetany in magnesium deprivation. Serum calcium likewise diminished to levels usually indicative of tetany. Alkali reserve and pH diminished, blood chlorides mounted as the erythrocyte volume fell, fibrinogen increased, terminally inorganic phosphorus decreased, and nonprotein nitrogen rose. Significant changes did not appear in serum sodium and potassium, plasma total lipids, fatty acids, total cholesterol, cholesterol esters, lipoid phosphorus, serum bile pigment, and plasma albumin and globulin."

The effect of mono-, di-, and tricalcium phosphates on reproductive success in rats, W. M. COX, JR., and M. IMBODEN (*Jour. Nutr., 12 (1936), No. 5, pp. 509–514, fig. 1*).—In continuation of a previous study (E. S. R., 76, p. 129) and with the same basal diet and technic, similar experiments were conducted during 11 reproductive cycles to determine the effect of primary, secondary, and tertiary calcium phosphates fed at a high calcium level. With the level of calcium intake at 2.45 percent of the diet, the range of calcium: phosphorus ratios which insured optimum reproductive performances was from 1.2 to 1.7 approximately. The tertiary phosphates with a calcium: phosphorus ratio of 1.63 gave a final success grade of 79.5 with 40 complete gestations and none incomplete, 324 living young of which 216 were available to raise, 37 complete

lactations, 76.4 percent of the available young raised, and an average weight at the end of the weaning period of 46.37 g. The secondary phosphate with a calcium: phosphorus ratio of 1.15 gave a final success grade of 73.6 with 45 complete gestations and 1 incomplete, 378 living young and 251 available to raise, 27 complete lactations, 46.6 percent of the available young raised, and an average weight of 40.01 g at 21 days of age. The primary phosphates proved inadequate for reproductive processes, giving a final success grade of 6. The mother rats on the secondary and tertiary phosphates showed no gross signs of excessive mineral intake on the high calcium ration and in the absence of vitamin D.

A note on the identity of the indophenol-reducing substances in brain tissue, F. G. Young (*Biochem. Jour., 30 (1936), No. 10, pp. 1883–1885*).—Chemical evidence is presented to show that the existence of an indophenol-reducing factor other than ascorbic acid in brain tissue has not been conclusively demonstrated. A crude extract was obtained from ox brain by alcoholic extraction which contained approximately 1 milligram equivalent of an indophenol-reducing factor per cubic centimeter. The extract at pH 10 was inactivated by aeration, readjusted to the original pH value, and pure ascorbic acid was added in an amount equivalent to the indophenol-reducing factor removed by aeration. The properties of this "reconstituted crude extract" were compared with those of the original crude extract. The ascorbic acid and indophenol-reducing factor present were estimated by the reduction of 2,6-dichlorophenol-indophenol, following the technic of Birch et al. (E. S. R., 70, p. 741).

Since the properties of the reconstituted crude brain extract containing pure ascorbic acid resembled those of the crude brain extract containing the indophenol-reducing factor, "there is, therefore, no reason to believe that the indophenol-reducing substance in crude brain extracts is other than ascorbic acid."

Recent trends in vitamin research, R. A. Dutcher (*Jour. Home Econ., 28 (1936), No. 9, pp. 621–630*).—The author discusses representative types of research work and reviews particularly the types of investigations carried on at Pennsylvania State College. "It would appear . . . that the predominating trends in vitamin research at present (as in the recent past) are in the direction of the isolation of vitamins and the determination of configuration followed by laboratory synthesis; the improvement and standardization of assay technics and of vitamin unitage; the reestimation of vitamin content of foods, vitamin stability during food processing, and so on, using the newer technics; and further elucidation of the vital physiological functions of vitamins in the living organism."

The effect of processing on vitamins in fruits and vegetables: A review, C. R. Fellers (*Massachusetts Sta. Bul. 338 (1936), pp. 23*).—This literature review covers the effects of storage, freezing, drying, and thermal treatments on the various vitamins as present in fruits and vegetables. Less than a page each is given to vitamins D and E, a little over one to vitamin G (B_2), two pages to vitamin B (B_1), about three pages to vitamin A, and eight pages to vitamin C, the distribution of space reflecting the extent of work on vitamin C since the development of a rapid chemical method for its determination. General conclusions are given concerning the stability of the various vitamins to the factors studied, and a list of 235 references is appended.

The accuracy of vitamin A determinations.—The starting-point of the test period, K. H. Coward (*Biochem. Jour., 30 (1936), No. 11, pp. 2009–2011*).—In continuation of previous studies (E. S. R., 68, p. 565), the author calculated from the formula $\lambda = \sigma/\text{slope}$ of curve of response, the degree of accuracy of the test obtained during each of the 5 weeks of dosing the experimental rat.

The calculation is based on data obtained from 960 male and 1,110 female rats. All of these had lost weight before receiving the vitamin A supplement, and many continued to lose weight for a short time before recovery began.

The greatest accuracy was obtained by counting the test period from the first day of dosing, since it was found that the slope of the curve of response for each week's increase in weight became slightly less in successive weeks, while σ remained constant.

The utilization by the rat of vitamin A and carotene administered in different media, K. H. Coward (*Biochem. Jour.*, *30* (*1936*), *No. 10*, *pp. 1878–1882*).—A comparison was made of the variation in the response of large numbers of rats to the vitamin A contained in cod-liver oil, the carotene in plant tissue, the vitamin A and carotene in butter, and the vitamin A of margarines containing a vitamin concentrate. Approximately 2,100 rats were maintained on a vitamin A-free diet supplemented by doses of the test material or the vitamin A standard. The response of rats to a dose of vitamin A given daily for 5 weeks after they had ceased to grow on the A-deficient diet was estimated from the calculated standard deviation of a single determination (E. S. R., 68, p. 565).

No significant difference in response was noted, and it is concluded that there is no difference in the ability of animals to utilize vitamin A or carotene administered in different media. " The causes of the difference in effectiveness of carotene dissolved in different oils must be sought elsewhere."

Studies on vitamin A deficiency.—I, Xerophthalmia and trigeminal nerve degeneration, M. V. Radhakrishna Rao (*Indian Jour. Med. Res.*, *24* (*1936*), *No. 2*, *pp. 439–457*, *pls. 8*).—The relationship between xerophthalmia and lesions occurring in the sensory nerve of the eye was investigated in young rabbits, rats, and fowls on vitamin A-deficient, stock, and control diets; on groups of rats and rabbits maintained on vitamin B_1-deficient diets; and on animals receiving carotene supplements to the vitamin A-deficient diets. The animals were killed at various periods before and after the development of xerophthalmia, and the eye and its adnexa, Gasserian ganglia, liver, and other tissues were studied macroscopically and microscopically. The trigeminal nerves with their branches, optic nerves, and some of the peripheral nerves were also examined.

The rabbits proved to be the most satisfactory experimental animals, due to the regularity with which they developed xerophthalmia. The degenerative changes present in the nerve cells and fibers did not appear to be specific for vitamin A deficiency, since similar changes were noted to a less degree in the animals maintained on the vitamin B_1-deficient diets. The following observations are made:

"Xerophthalmia and myelin degeneration in the afferent nerves of the eye were often present in animals deprived of vitamin A and carotene. Varying degrees of myelin degeneration in the sensory nerve . . . supplying the conjunctiva and cornea were present before the appearance of any lesions, macroscopic or microscopic, in the latter. When xerophthalmia was present there was no exact parallelism between the intensity of the changes present in the corresponding sensory nerve and in the cells of the Gasserian ganglion and the intensity of the eye lesions. Animals in which the eye lesions on either side varied markedly showed about the same degree of degeneration in both the corresponding trigeminal nerves. Complete recovery of the lesions and the corresponding sensory nerves did not occur in animals in which the corneal lesions were healed by the addition of carotene to the diet. There is no evidence to suggest that xerophthalmia is secondary to a loss of the neurotrophic control of the ophthalmic division of the trigeminal nerve."

The use of colloidal adsorbents with vitamin B.—A preliminary study, D. STEIN and E. H. KOTIN (*Clin. Med. and Surg., 44 (1937), No. 3, pp. 115–117*).—Kao-Lactos B, which consisted of approximately 50 percent colloidal kaolin and 50 percent lactose, with 125 units of vitamin B_1 and 25 units of vitamin B_2 per ounce, was fed to 12 patients aged from 10 to 60 yr. showing clinical symptoms of avitaminosis and secondary anemia, together with diseased conditions of the gastrointestinal system. The synergistic effect of the vitamin B_1 to the action of the colloidal kaolin was studied by noting the general progress made by the patients during the 3 mo. of treatment and the changes in hemoglobin percentage, red blood cell count, and sedimentation rate.

A general improvement and feeling of well-being were noted, with increase in weight, red blood cells, and hemoglobin, and a lowering of the sedimentation rate. One case of carcinoma of the colon showed some symptomatic improvement, although the organic lesion progressed. Cases of chronic cholecystitis and tuberculous enteritis were temporarily relieved, and excellent results were obtained in functional cases of duodenitis and ulcerative colitis. In most cases gaseous eructations and constipation were relieved.

The influence of the length of the test period on the accuracy obtainable in a vitamin B_1 test, K. H. COWARD (*Biochem. Jour., 30 (1936), No. 11, pp. 2012–2015*).—Following the technic previously described (E. S. R., 70, p. 876) of testing for vitamin A by the increase in weight method, the author determined the average variance in response of male and female rats to doses of vitamin B_1 in tests lasting 1, 2, and 3 weeks, and measured the slope of the curves of response relating increase in weight to the vitamin B_1 dose. The formula $\lambda=\sigma$/slope of curve of response was used to determine the degree of accuracy obtained in the test.

The curve of response of bucks was only very slightly steeper than for does, showing that equal numbers of each sex in each group are not necessary. With 10 pairs of animals the probable error of a determination of vitamin B_1 was approximately 18, 12.5, and 10 percent, respectively, for the first, second, and third weeks. Thus, the accuracy was only very slightly increased by extending the test period from 2 to 3 weeks.

Experiments upon the extraction and stability of vitamin B (B_1) and of lactoflavin, B. BISBEY and H. C. SHERMAN (*Jour. Biol. Chem., 112 (1935), No. 1, pp. 415–420, fig. 1*).—The extraction of vitamin B_1 and flavine from skim milk powder is described, and a series of fractional extraction experiments in which the extraction was carried through first with absolute alcohol and later with 80 percent alcohol are discussed. Feeding tests on rats were made with the preparations, following the methods (E. S. R., 66, p. 410) of Chase and Sherman for determining vitamin B_1 and of Bourquin and Sherman for flavine.

The vitamin B_1 values were found to be well conserved by this method of extraction and the vitamin G or flavine values to a less extent. Practically all of the vitamin B_1 was extracted from the milk by 80 percent alcohol and practically none of it by absolute alcohol. The flavine was not measurably extracted by absolute alcohol and only a portion of it by 80 percent alcohol. The symptoms of nutritional deficiency in the experimental animals served as a means of identifying the two factors.

Vitamin B in lamb tissues and organs, M. KELLOGG (*South Dakota Sta. Bul. 306 (1936), pp. 43*).—This is the complete report of an investigation noted previously from progress reports (E. S. R., 75, p. 728). The term vitamin B as used in the studies reported includes vitamin B_1 as determined by the method of Chase and Sherman and B_2 (G) as determined by the method of Bourquin and Sherman (E. S. R., 66, p. 410). Attention is called to the report

of Bisbey and Sherman noted above, indicating that the Bourquin-Sherman method is a measure of the flavine component of the vitamin B complex. The lambs used were well-finished, with carcasses graded as choice. The B_1 determinations were made on the fresh material and the flavine values on canned material autoclaved at 15 lb. pressure for 1 hr.

The estimated values for vitamin B_1 are given as meat 2+, liver 2+, kidney 3+, heart 3, tongue 1—, brain 2, and pancreas 2 Sherman units per gram of fresh material. Corresponding values for B_2 (flavine) are meat 1.3, liver 6.6, kidney 6.6, heart 10, tongue 2, brain 1.6, pancreas 3.3, and thymus 10 units per gram of canned material. These values indicate that vitamin B_1 is fairly evenly distributed in lamb tissues and organs, while vitamin B_2 (flavine) varies widely.

Growth-promoting activity of lactoflavin administered orally and parenterally, P. György (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 1, pp. 207–209*).—The physiologic growth-promoting actions of free lactoflavine and of pure (synthetic) lactoflavine-5-phosphoric acid were compared by the administration to rats of graded doses of each form, orally and parenterally, following the method of feeding experiments previously described (E. S. R., 75, p. 282). The casein AB Glaxo and rice starch in the basal diet were replaced by extracted casein and cornstarch, respectively.

The results indicate that the growth-promoting effect of lactoflavine or of lactoflavine-5-phosphoric acid is independent of the way it is administered and that the two materials are biologically similar, since the average weekly weight gain was approximately 8 g when from 3.2γ to 15γ of either material was administered orally or parenterally each day. The rat day dose for both is about from 7γ to 10γ. "It can therefore safely be assumed that the phosphorylation of lactoflavine is not only an intestinal but also a general cellular reaction."

Lactoflavin in the treatment of canine blacktongue, W. H. Sebrell, D. J. Hunt, and R. H. Onstott (*Pub. Health Rpts. [U. S.], 52 (1937), No. 9, pp. 235–239*).—Five dogs were placed on the basic blacktongue-producing diet No. 123 of the following composition: Corn meal 400 g, cowpeas 50, purified casein 60, sucrose 32, cottonseed oil 30, cod-liver oil 15, sodium chloride 10, and calcium carbonate 3 g. The dogs showed well-developed attacks of the blacktongue within from 36 to 73 days. The administration by mouth of from 5 to 10 mg of riboflavine (L. F. No. 356) to four animals and 38 mg to the fifth one failed to relieve the symptoms, and death ensued in from 1 to 30 days after beginning the treatment. These results are thought to add "further evidence to the view that riboflavine is distinct from the blacktongue-preventive factor."

The treatment of blacktongue with a preparation containing the "filtrate factor", and evidence of riboflavin deficiency in dogs, W. H. Sebrell, R. H. Onstott, and D. J. Hunt (*Pub. Health Rpts. [U. S.], 52 (1937), No. 15, pp. 427–433*).—Five dogs were placed on the basic blacktongue-producing diet No. 123, referred to above. When symptoms of blacktongue developed, rice bran filtrate K–37–A was given until they subsided and again upon recurrence.

Typical signs of acute blacktongue developed in the five animals in 131, 55, 13, 83, and 55 days, respectively, from the beginning of the experiment. One animal died in an attack of blacktongue without treatment, while three died in 115, 54, and 117 days, respectively, from the beginning of treatment with the filtrate without any signs of blacktongue, indicating the presence of the blacktongue-preventive factor in the filtrate. The remaining dog, while in a semicomatose condition 182 days after the beginning of the treatment identi-

cal with that which just preceded the deaths of the other three dogs, was given 8 mg intramuscularly of riboflavine (L. F. 356) and within 12 hr. had returned to normal. The blacktongue-producing diet No. 123 is thought to be deficient in riboflavine as well as in the blacktongue-preventive factor, and the deficiency in riboflavine the cause of the collapse and sudden death of the animals in the absence of signs of blacktongue.

Stomatitis due to vitamin B_2 deficiency, W. R. Aykroyd and B. G. Krishnan (*Indian Jour. Med. Res., 24 (1936), No. 2, pp. 411–417, pl. 1*).—Stomatitis, with erosions of the lips, mucous membrane of the tongue, and angles of the mouth, was observed in 16 boys and 25 girls, representing approximately 60 percent of the school children in two residential hostels. The diets were composed largely of milled parboiled rice and were deficient in almost all food factors. The general state of nutrition of the children was very poor. Four boys were given 1 oz. daily of dried brewers' yeast and the sore mouths were healed in from 1 to 4 weeks. The administration of 14 g of cod-liver oil daily for 3 weeks to 9 boys did not cure the condition until 1 oz. daily of the dried brewers' yeast had been given for from 4 to 7 weeks. The addition of 42 g of dried skim milk daily to the diet of the girls brought about a cure in all cases within from 3 to 4 weeks. The general condition of the children was noticeably improved following the administration of yeast and skim milk. It is assumed that the stomatitis was due to the deficiency of one or more of the factors in the vitamin B_2 complex.

Bacterial toxins and vitamin C in relation to tooth structure, W. F. Swanson, A. Sigal, and C. G. King (*Jour. Amer. Dental Assoc., 23 (1936), No. 11, pp. 2089–2096, figs. 10*).—Observations on the teeth of guinea pigs are recorded, with microphotographs, indicating "(1) that bacterial toxins may have an important role in causing injury to developing tooth structures without involving an actual infection of the tooth, and (2) that a high vitamin C intake or nutritional level is important in relation to the natural protection against such injury."

After from 10 to 15 days on a modified Sherman vitamin C-free diet, groups of guinea pigs were given varied doses of pure vitamin C daily, with and without subcutaneous injections of a bacterial toxin (diphtheria). Guinea pigs in the prescorbutic stage were found to be subject to marked injury to tooth structure from the bacterial toxin. The teeth of the animals on a high vitamin C intake and receiving toxin injections were only occasionally irregular.

Storage of vitamin C by normal adults following a period of low intake, P. H. O'Hara and H. M. Hauck (*Jour. Nutr., 12 (1936), No. 4, pp. 413–427, fig. 1*).—The subjects were four normal adult women maintained on an otherwise adequate basal diet containing 5 mg of vitamin C daily. During a 4- to 5-day preliminary period orange juice containing from 88 to 100 mg of ascorbic acid was given to insure a condition of vitamin C saturation. For from 29 to 30 days the basal diet alone was ingested, and then 200 mg of ascorbic acid in the form of orange juice were added until the subjects were again saturated, as shown by a constant urinary output of vitamin C. Capillary resistance tests were made weekly by the Göthlin method (E. S. R., 72, p. 422) and daily by means of the resistometer devised by Dalldorf (E. S. R., 73, p. 731). The Bessey and King method of titration with indophenol (E. S. R., 71, p. 137) was essentially followed in determining the vitamin C content of foods and urine specimens before and during the experimental period. All subjects were examined by a physician for symptoms of latent scurvy at the end of the 30-day period on the low vitamin C diet, and, with the exception of slight gingival bleeding in one subject, no clinical symptoms were found.

The ascorbic acid excretion fell below 0.02 mg per cubic centimeter per 24 r. at about the second day of the low vitamin C intake and did not return to that vel until from 5 to 9 days after the 200 mg of ascorbic acid supplement had een administered, at which time the total urinary excretion of vitamin C inged from 18 to 36 mg. Following the ingestion of the ascorbic acid supplement the concentration of vitamin C in the urine rose to 0.04 mg per cubic entimeter. From 2,200 to 2,800 mg of vitamin C were required to restore the issues to saturation following the period of low intake. If, as is suggested, the asic tissue reserve is represented by the difference between intake and excretion up to the point of saturation following prolonged deprivation of vitamin C, the maximum tissue reserve would appear to be about 2,500 to 3,000 mg.

During a 14- to 17-week test period marked variations in capillary resistance were noted, both in the same individual from time to time and in different ndividuals, and no correlation could be demonstrated either between the results obtained by the two methods or between the data on capillary resistance and he urinary excretion of vitamin C. It was concluded that capillary resistance lid not give an adequate indication of the vitamin C metabolism.

Effect of home canning and storage on ascorbic acid content of tomatoes, E. P. Daniel and M. B. Rutherford (*Food Res., 1 (1936), No. 4, pp. 341–347*).—In this contribution from the U. S. D. A. Bureau of Home Economics, ripe tomatoes of the Stone variety obtained from the same patch on 5 consecutive days were sampled, and the whole fruit and juice were canned in both glass jars and tin cans by the water bath method. Samples were tested after 24 hours' storage, and half of the remaining glass jars were wrapped in black photographic paper to exclude the light before being stored for 6 mo. The Bessey and King modification of Tillmans' titrimetric method (E. S. R., 71, p. 137) was followed in the determination of ascorbic acid, six titrations being made for each sample.

The fresh tomato contained an average of 0.2 mg of ascorbic acid per gram of extracted juice, with considerable variation among the different lots of fruit. The loss of ascorbic acid from the whole tomato, due to the canning process, was 21 percent in both unwrapped and wrapped jars, with 10 and 23 percent additional loss, respectively, during 6 months' storage. The tomato juice in the unwrapped glass jars lost 21 percent during the canning process and 24 percent during storage, while in the wrapped jars the values were, respectively, 21 and 34 percent. Whole tomatoes in tin cans lost 12 percent during canning and 13 percent during storage. The values for tomato juice in tin cans were, respectively, 11 and 10 percent. It appears that from one-fourth to one-half of the ascorbic acid content of home-canned tomatoes stored at ordinary room temperature may be lost before the fruit is consumed, with the greatest loss occurring in the whole fruit and juice in glass containers with the light excluded and the least loss in tin containers.

HOME MANAGEMENT AND EQUIPMENT

A study of price differences in retail grocery stores in New York State, L. Doman (*[New York] Cornell Sta. Bul. 665 (1937), pp. 52*).—This study was made "to obtain information relative to the money savings possible for household buyers who can take advantage of the differences in prices commonly found among retail grocery stores. Three types of price differences were studied: (1) Differences between sale prices and regular prices of identical articles in the same store, (2) differences between prices of identical articles on the same day in stores of the same shopping district, and (3) differences

between prices on different quantities of identical products in the same store." Regular prices and sales prices (6,358 sale offers during February–May 1931) of canned and packaged goods and bulk granulated sugar and bulk rice sold by grade were collected from 141 chain, 32 cooperative chain, and 77 independent stores in 59 localities of the State with a population of from less than 1,000 to approximately 560,000 people.

Analysis was made of the reductions on sale offers in the case of unit and multiple-unit and combination and premium offers, the offers of different brands of goods and in different commodity groups, commodities of different prices, etc Comparisons were made of prices at high- and low-price stores and of prices on the basis of quantity, size of containers, etc. The significance of differences of prices to household buyers is discussed.

Seventy-three percent of the unit and multiple-unit sale offers were lower than the regular price quotations on the same articles, 25 percent at regular prices, and 1 percent at higher than regular prices. The percentages of reduction ranged from 1 to 50, averaging 14.4, in chain stores; from 1 to 50, averaging 14.8, in cooperative chain stores; and from 1 to 52, averaging 15.6, in independent stores. The reductions on combined unit and multiple-unit sale offers from all stores averaged 5 ct. on each offer and 2 ct. on each unit included. "There were no significant differences in price reductions on the goods of different brands", the average reduction being 14.8 percent. "The average percentage price reductions on sale offers of specific classes of goods did not vary greatly from the average on all offers combined." "In 17 of the 38 districts studied, the differences between high and low prices on all 20 articles priced in the districts—each expressed as a percentage of the high price of the district—averaged from 11 to 15 percent."

Home conveniences on Tennessee farms with regional comparisons, C. E. Allred and W. E. Hendrix (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 30 (1937), pp. [1]+III+41, figs. 21*).—In the nine representative Tennessee counties studied, 96.6 percent of all farm dwellings are heated by fireplaces and stoves. Electric lights are used in 5.5 percent. Wells furnish water for 58 percent, springs and cisterns each for about one-fourth, and streams for 1.3 percent, with 10 percent of the farms having running water piped into dwellings, and 90 percent carrying water for an average distance of 209 ft. Either improved outdoor toilets or indoor chemical or flush toilets are used in 17.8 percent of the farm homes, 52.8 percent use unimproved outdoor privies, and 29.4 percent lack toilet facilities. Bathtubs are found in 2.7 percent of all farm dwellings, showers in 0.9 percent, and lavatories in 2.1 percent. Of dwellings occupied by white owners, 10 percent have kitchen sinks with drains, compared with 2.4 percent for white tenants, 0.6 percent for Negro owners, and 0.3 percent for Negro tenants. More than one in five (21 percent) farm families have refrigerators in their home, and the proportion in Obion County is 60 percent. Few farm families have improved laundry facilities. Wood or coal stoves are used in 93.6 percent of all farm homes for cooking. Eighteen percent of the farm families in the State had telephones in 1930 and 4.8 percent had radios. Lawns have been established by 64 percent of the farm families surveyed, and plantings of shrubbery have been made by 56 percent.

Census data on electric lights, running water in dwellings, and radios show that the percentage of farm people in the State as a whole using these facilities has more than doubled since 1920. The percentage of farms reporting telephones, however, decreased from 22.5 percent in 1920 to 18 percent in 1930.

"A comparison of Tennessee with other States shows that Tennessee ranks high among Southeastern States in modern improvements for the homes. In most items, however, other regions of the United States are above the Southeastern States."

Selection and use of the electric iron, P. B. POTTER and F. H. BASS (*Virginia Sta. Bul. 307 (1937), pp. 30, figs. 12*).—This publication includes a preliminary discussion of the ironing process, with data on the optimum moisture content and temperatures for ironing linen, cotton, and rayon fabrics. The results are then presented and discussed of performance tests on 21 electric irons of well-known makes and models. The irons are listed by code number, with data on wattage rating, weight, area of ironing surface, and watts and weights per square inch of surface. The series of tests reported include block or no load, operating, scorch, and life tests, with checks on thermostat action and repeat block tests.

To aid the housewife in the interpretation of the data for the selection of an electric iron, certain features which should be considered are discussed in some detail. These include weight, wattage, thermostat, cords, and miscellaneous features. Finally, a list of suggested standard specifications for electric irons in terms of safety, size, durability, performance, and guarantee is presented, with the recommendation that all irons operated by electricity and designed for household use should meet these tests and specifications and "upon so doing should be marked with a distinctive emblem by the manufacturer as an indication and guarantee of first grade quality and performance."

MISCELLANEOUS

Forty-seventh Annual Report of the Storrs Agricultural Experiment Stations, Storrs, Connecticut, for the year ending June 30 1935, W. L. SLATE ET AL. (*[Connecticut] Storrs Sta. Rpt. 1935, pp. [440], figs. 55*).—This includes reprints of Bulletins 207–212, previously noted, and of Bulletin 213, abstracted on page 552 of this issue.

Report of the director [of the Storrs Station], 1936, W. L. SLATE (*[Connecticut] Storrs Sta. Bul. 214 (1937), pp. 31*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Biennial Report of the Rice Experiment Station, Crowley, Louisiana, 1935–1936, J. M. JENKINS ET AL. (*Louisiana Sta., Rice Sta. Bien. Rpt. 1935–36, pp. 19*).—The experimental work not otherwise referred to is for the most part noted elsewhere in this issue.

Fifty-seventh Annual Report of the New Jersey State Agricultural Experiment Station and the Forty-ninth Annual Report of the New Jersey Agricultural College Experiment Station for the year ending June 30, 1936, J. G. LIPMAN (*New Jersey Stas. Rpt. 1936, pp. XXIII+145*).—The experimental work not previously referred to is for the most part abstracted elsewhere in this issue.

Findings in farm science from Wisconsin's proving ground: Annual report of the director [Wisconsin Station, 1936], compiled by N. CLARK and N. HOVELAND (*Wisconsin Sta. Bul. 438 (1937), pp. [2]+168, figs. 37*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Purdue University and Indiana Station.—Dean and Director J. H. Skinner has returned from a 7 months' leave of absence. Dr. J. L. Roberts became soil microbiologist July 1.

Massachusetts Station.—Dr. Carl Olson, Jr., assistant professor of pathology and bacteriology in the New York State Veterinary College, has been appointed research professor in veterinary science, primarily for studies of poultry problems.

Montana College and Station.—Dr. A. L. Strand has been appointed president effective August 1. He has been succeeded as head of the department of entomology and State entomologist by Dr. H. B. Mills, previously assistant State entomologist.

New Hampshire Station.—Fire on July 12 destroyed the agricultural engineering building, originally the dairy barn. It will be replaced by a brick structure.

North Dakota Station.—Dr. H. C. Hanson, chairman of the department of botany and plant pathology, has been appointed acting director, effective August 13, Dr. H. L. Walster continuing as dean of the division of agriculture.

Rhode Island Station.—Beginning June 1, the station staff became eligible under the State Retirement System, a contributory insurance plan with the State paying a portion of the premium. Workers at the station previous to July 1, 1936, were given credit for this service. Retirement is optional at the age of 60 and compulsory at 70.

Dr. Irene H. Stuckey has been appointed assistant plant physiologist, beginning July 1.

Utah Station.—Dr. Lowry Nelson resigned as director on August 31 to become professor of rural sociology in the University of Minnesota.

Virginia Polytechnic Institute.—A tract of 2,500 acres in Giles County has been acquired for the use of the biological department. This land is located 18 miles from the college, adjacent to the Jefferson National Forest at an elevation of from 2,000 to 4,000 ft., and provides a wide variety of flora and fauna. It is planned so to manage the area as to restore primitive conditions, though some demonstrations in wildlife and forestry management will be undertaken. The tract is expected to be of special value for advanced students in wildlife conservation, forestry, botany, zoology, plant pathology, and entomology.

Fourth International Grassland Congress.—This Congress was held at various points in Great Britain from July 8 to 23, 1937, under the presidency of Director R. G. Stapledon of the Welsh Plant Breeding Station. The attendance numbered about 450, representing 37 countries, the largest delegation from abroad being that of the United States. In addition to a large number of papers, tours over much of England, Scotland, and Wales were a special feature of the program.

Invitations were received to hold the Fifth Congress in 1940 in the Netherlands and the Sixth Congress in 1943 in Hungary. The invitation for 1940 was accepted, and its proponent, Dr. J. Huizinga, elected president. A volume of abstracts of all papers read at the Congress is already available, and it is expected that the full report of the proceedings will be ready this fall.

U. S. GOVERNMENT PRINTING OFFICE: 1937

EXPERIMENT STATION RECORD

VOL. 77 NOVEMBER 1937 No. 5

ADDITIONAL CHANGES IN EXPERIMENT STATION LEADERSHIP

The calendar year 1937 seems likely to be associated in experiment station annals with an unusual number of changes in the leadership of these institutions. Reference has already been made in the *Record* to the death of Director C. P. Blackwell of Oklahoma, the retirement of Directors F. B. Linfield of Montana and C. G. Williams of Ohio, the transfer to full-time service as dean of the division of agriculture of Director H. L. Walster in North Dakota, the resignation of Director Lowry Nelson in Utah, and the return to experiment station work of former Director P. S. Burgess in Arizona. In addition, supervision of the experiment station and extension service in the Alaska College has now been combined under Director L. T. Oldroyd of the extension service, with the former station director, G. W. Gasser, continuing as dean of men and professor of agriculture. In Maryland Director H. J. Patterson retired on October 1 under the new university retirement act, and announcement has been made of the prospective retirement early in 1938 of Director U. P. Hedrick of the New York State Station. Most recent of all, at the time of writing, is the resignation of Director R. Y. Winters of North Carolina as of October 15, 1937, to accept an appointment as a principal experiment station administrator in the Office of Experiment Stations.

Thus there are disappearing from the station ranks many leaders of long experience and unique service. Among these, special mention should be made of Director Patterson, whose association with the Maryland Station covers virtually its entire history. A graduate of the Pennsylvania State College in 1886 and with 2 years' service as assistant chemist in that institution, he was appointed chemist of the Maryland Station soon after its organization in 1888. About 10 years later he began his service of nearly 40 years as director, also serving as president of the college from 1913 to 1917 and since 1925 as dean of agriculture. Thus he has been intimately identified with the growth and development of the institution for nearly half a

century. When he was appointed director, the station staff numbered 13 and the annual income was under $17,000. For the past year there were over 60 staff members and an income in excess of $200,000. Supported for many years entirely from Federal funds, the station now receives about $100,000 annually from State sources. This evolution is a tangible recognition of the interest which he did much to arouse and reflects the confidence which he has consistently inspired and retained. He will be greatly missed by the institution in whose upbuilding he has played so prominent a part. In his stead there has been appointed as acting director of the station J. E. Metzger, assistant director and head of the department of agronomy.

Director Hedrick is also bringing to a close a long period of conspicuous station activity. A recipient from the Michigan College of the B. S. degree in 1893 and the M. S. degree in 1895, he engaged in horticultural teaching and investigation in the agricultural colleges and experiment stations of Michigan, Oregon, and Utah until he was appointed head of the department of horticulture in the New York State Station in 1905. Sixteen years later he was named vice director, and in 1928 director. As an investigator he became widely known as a developer of numerous outstanding varieties of fruits and as author of a series of monographs of the hardy fruits and of A History of Agriculture in the State of New York, published in 1933. As director, Dr. Hedrick has striven especially for three objectives—the enlargement of the station's physical plant, the beautification of its grounds, and, without sacrifice of research ideals and programs, the development of closer relations with the farmers of the State through the simplification and popular interpretation of its published material and the wide dissemination of its results. In all of these respects, as well as in others, distinct progress has been made under his leadership. An already strong station has been further strengthened.

Director Winters severs an association with the North Carolina Station of nearly 26 years, of which about half have been devoted to constructive administration. Born in South Carolina in 1886, he received from Clemson College the B. S. degree in 1906, and the honorary D. Sc. degree in 1937, the M. S. degree from the University of Florida in 1909, and the Ph. D. degree from Cornell University in 1911. After some years of botanical work in the University of Florida and Cornell University, he was appointed agronomist and plant breeder in North Carolina in 1912, and became director in 1925. In addition to building up the station itself in various ways, he has been active in many regional cooperative undertakings in the Southeast and is unusually familiar with its agricultural problems. In his new duties with the Office of Experiment Stations, it is expected to

make wide use of his distinctive research and administrative experience and outlook in the development of projects and programs in this region, which receives a large percentage of funds under the Bankhead-Jones Act and presents an especially attractive opportunity.

SIXTH GENERAL INDEX TO EXPERIMENT STATION RECORD

The recent publication of the sixth general index to *Experiment Station Record* makes available in convenient form subject-matter references to all material printed in these columns before July 1934. Ten volumes are again included, volumes 61–70, covering the period 1929–34.

The new general index follows closely the lines of its predecessors, preserving the continuity of policy and treatment. The total number of pages is 752, an increase of over 10 percent over the previous index. The subject index entries approximate 60,000, and under many of them, of course, a number of references are made. This expansion reflects the ever-increasing bulk of the literature covered.

Largely because of the high cost of publication of an index of this type, the edition is much smaller than for the monthly issues of the *Record*, precluding a distribution to the regular mailing list. The needs of libraries are being met, however, and it is thought that the supply will permit a reasonably complete institutional distribution. Individuals and others not eligible for inclusion in the free distribution should find no difficulty in purchasing the index from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price set by that official is 75 ct. per copy.

Inquiry is frequently made as to the earlier general indexes. The second of these, covering volumes 13–25, has been completely exhausted for some time, but there is still a small reserve stock for the remaining issues. The index for volumes 1–12 may be purchased from the Superintendent of Documents for 50 ct., and the indexes for volumes 26–40, 41–50, and 51–60 for 75 ct., $1.25, and 60 ct., respectively. They are also still available for institutional use in the free distribution, and within the limits of the supply the needs of teaching and research departments and similar agencies will be met on direct application to the Office of Experiment Stations, U. S. Department of Agriculture.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical researches of the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 393 (1937), pp. 171, 172*).—This work has included investigations into the chemistry of the tobacco plant, work on the determination of purine nitrogen in leaves and on the determination of glutamine, investigation of the metabolism of amides (especially glutamine and asparagine) in tobacco leaves, and work on improvements in the methods for isolating the dicarboxylic amino acids from the products of protein hydrolysis.

[Chemical investigations at the Nebraska Station] (*Nebraska Sta. Rpt. [1936], p. 8*).—The report contains concise notes on the preparation and study of the cereal glutelins and enzymes of wheat flour as related to flour grade and baking characteristics.

Electrokinetics.—XVI, Streaming potential in small capillaries, H. B. Bull and L. S. Moyer (*Jour. Phys. Chem., 40 (1936), No. 1, pp. 9–20, figs. 4; abs. in Minnesota Sta. Rpt. 1936, p. 16*).—Conditions in a membrane are considered in this contribution to a series from the Minnesota Experiment Station (E. S. R., 75, p. 582) in relation to the measurement of the streaming potential.

The equation for the potential between two coaxial cylinders has been substituted for the conventional plate condenser equation in the case of small pore radii. J. Lens'[1] modification of the thickness of the double layer in thin slits has been introduced into this equation, and the critical value of the radius has been estimated by this method. These equations have been compared with the critical radius calculated from S. Komagata's[2] equations. It is found that the two sets of equations do not yield concordant results except when the radius is large. The change in the viscosity of water with capillary size has been considered. The electrical "counterpressure" has been compared with the mechanical pressure, and an equation expressing this relationship has been derived. A method for obtaining the average pore radius has been developed and tested. The theoretical critical pore radius has been compared with those actually found in diaphragms. The two values do not agree in the case of quartz and glass. Anomalies in the zeta-concentration and flow-concentration curves of quartz diaphragms with pores below the critical point are noted. These curves are compared with those given by cellulose, which behaves in a normal manner.

Electrokinetics.—XVII, Surface charge and ion antagonism, L. S. Moyer and H. B. Bull (*Jour. Gen. Physiol., 19 (1935), No. 2, pp. 239–247, figs. 5; abs. in Minnesota Sta. Rpt. 1936, p. 15*).—The question of the critical pore diameter for streaming potential is discussed in a further contribution to this series.

The surface charge is calculated for cellulose in contact with solutions of K_3PO_4, K_2CO_3, K_2SO_4, KCl, and $ThCl_4$. The surface charge of cellulose in contact with a solution of 2×10^{-4} N NaCl is calculated as a function of tempera-

[1] Roy. Soc. [London], Proc., Ser. A, 139 (1933), No. A 839, pp. 596–603, figs. 3.
[2] Electrotech. Lab., Tokyo, Japan, Res., No. 362 (1934), pp. [3]+49, figs. 16.

ture and is found to show a sharp break at 39° C. This is interpreted in terms of the change of the specific heat of water. A marked ion antagonism is found in NaCl : KCl, KCl : $MgCl_2$, NaCl : $MgCl_2$, NaCl : $CaCl_2$, KCl : $CaCl_2$, $CaCl_2$: $MgCl_2$ mixtures when the surface charge is calculated as a function of concentration.

Molecular dimensions from viscosity studies, R. M. THEIS and H. B. BULL (*Jour. Phys. Chem., 40 (1936), No. 1, pp. 125–131, figs. 2; abs. in Minnesota Sta. Rpt. 1936, p. 17*).—The authors report in this contribution from the Minnesota Experiment Station certain difficulties encountered in the application of generalized equations to a specific case of data obtained in a study of the lecithin molecule.

Physico-chemical studies on lecithin, H. B. BULL and V. L. FRAMPTON (*Jour. Amer. Chem. Soc., 58 (1936), No. 4, pp. 594–596, figs. 2; abs. in Minnesota Sta. Rpt. 1936, p. 17*).—This contribution from the Minnesota Experiment Station reports upon a study of lecithin-cephalin mixtures prepared from eggs.

The importance of the effect of cephalin upon the isoelectric point was brought out. The isoelectric point is plotted as a function of the amino nitrogen content. The curve is extrapolated to zero amino nitrogen content and yields an isoelectric point of 6.4 for lecithin.

The change of the isoelectric point with time was also studied, and titration curves for lecithin suspensions are reported.

The lipids of the wheat embryo, I, II, B. SULLIVAN and C. H. BAILEY (*Jour. Amer. Chem. Soc., 58 (1936), No. 3, pp. 383–390; 390–393; abs. in Minnesota Sta. Rpt. 1936, p. 23*).—The two papers here noted open a serial contribution from the Minnesota Experiment Station.

I. *The fatty acids.*—This records the observations that saturated fatty acids constituted 16 percent of the total fatty acids of wheat embryo lipides and consisted largely of palmitic acid, together with smaller amounts of stearic and lignoceric acids, and that unsaturated fatty acids, representing 84 percent of the total fatty acids, were divided approximately as follows: α- and β-linolenic acids 3.55 percent, α- and β-linolic acids 52.31 percent, and oleic acid (by difference) 28.14 percent. No fully saturated glycerides were encountered in these lipides, the latter being composed of mixed, unsaturated-saturated glycerides, some tri-unsaturated glycerides, and an unidentified carbohydrate.

II. *The unsaponifiable fraction.*—This reports that the unsaponifiable fraction of the wheat embryo amounts to about 4 percent. Approximately 70 percent of this fraction consists of a mixture of sterols, about 56 percent of which occur in the free state. Measurements of unsaturation of the sterol fraction by per acids show the presence of an unsaturated sterol with at least two double bonds in addition to the isomeric sitosterols and dihydrositosterol. Determination of unsaturation on sterols by iodine values was found to be unreliable. The nonsterol fraction of the unsaponifiable material required 2.91 percent available oxygen. Preliminary work on this fraction indicates the presence of polyene hydrocarbons as well as an alcohol.

Water absorption of spray and roller dried milks, O. SKOVHOLT and C. H. BAILEY (*Northwest. Miller and Amer. Baker, 12 (1935), No. 8, pp. 358, 359, 394; abs. in Minnesota Sta. Rpt. 1936, p. 18*).—This contribution from the Minnesota Experiment Station reports upon experiments in which particle size of roller process milk was determined by a sedimentation method and found to be substantially larger than typical spray process milk. Viscosity of reconstituted roller milk, as determined by a capillary viscometer, was also appreciably greater than reconstituted spray process milk. The former decreases in viscosity as the preparation stands for a time, whereas the latter changes only slightly. The batters made with flour and dried milks were then prepared,

and those made with roller process milk proved to be more viscous than when spray process milk was employed, but when the proportion of water was reduced the reverse was the case as was also true with doughs. Accordingly the viscosity of their mixtures may not correlate with the water absorption registered by dry milk when used in an ordinary dough and particularly when comparing spray and roller milks.

Chemical nature of citrin, V. BRUCKNER and A. SZENT-GYÖRGYI (*Nature [London], 138 (1936), No. 3503, p. 1057*).—Further work on the crystalline flavone fraction of lemon juice capable of curing disorders of the capillary wall and termed citrin has shown it to consist of mixed crystals of two different dyes. One of these, hesperidin, m. p. 261° [C.], forms the major part of citrin, but the activity and color reactions are due to the other component, eriodictyol glucoside, a demethylated hesperitin. The active eriodictyol glucoside was not found in any considerable quantity in unripe oranges, while hesperidin was present in considerable amounts. The probability is suggested that eriodictyol glucoside is formed from hesperidin by demethylation during the ripening of the fruit.

Studies on biological oxidations.—VII, The oxidation of ascorbic acid in biological fluids, E. S. G. and A. G. BARRON and F. KLEMPERER (*Jour. Biol. Chem., 116 (1936), No. 2, pp. 563–573, figs. 3*).—In continuation of a series of papers, some of which have been noted (E. S. R., 75, p. 741), a comparison is reported of the rate of oxidation of ascorbic acid in two classes of biological fluids. In one of these inhibitory mechanisms protecting ascorbic acid from oxidation appear to be present, while in the other ascorbic acid is oxidized at a measurable speed attributed to the presence of acid-oxidizing enzymes. An effort was also made to discover the nature of the protective action in the first group and the oxidizing catalysts in the second. Similar methods were followed as in the fifth study of the series, care being taken to avoid contamination of the fluid by heavy metals.

The rate of oxidation of ascorbic acid in fluids of the first group was determined with and without the addition of $CuCl_2$. The fluids of animal origin tested included blood serum, cerebrospinal fluid, urine, saliva, and gastric juice of man; whole blood of dog; aqueous vitreous humor of cattle; and cow's milk; and of vegetable origin, orange, tomato, and grapefruit juices. In the absence of added catalysts all these fluids protected in varying degrees the oxidation of added ascorbic acid, the protection being complete with gastric juice, milk, and orange, tomato, and grapefruit juice. When $CuCl_2$ was added the greatest protective power was shown by blood serum, milk, and tomato juice and the least by urine, saliva, and grapefruit juice. It was demonstrated that glutathione, proteins, and amino acids (by the formation of un-ionized copper complexes) are the most important mechanisms for the protection of ascorbic acid in the biological fluids possessing such inhibitory action.

As representative examples of the group of biological fluids possessing no inhibitory mechanism, juices extracted from apples, cabbage, yellow squash, peaches, and water cress were selected. Because of the low buffering power of these fluids the ascorbic acid was previously neutralized by sodium carbonate. The most rapid oxidation of ascorbic acid occurred with yellow-squash juice, followed by the juices of lettuce, peaches, cabbage, apples, and water cress. In order to determine the catalysts responsible for the oxidation of ascorbic acid in these fluids, two types of inhibitors were used—(1) HCN which inhibits oxidations produced by hemochromogens and (2) 8-hydroxyquinoline which inhibits those produced by copper. The oxidation produced by the juices of cabbage, yellow squash, and water cress was the same with and without 8-hydroxy-

quinoline, showing that the oxidation in these biological fluids was not due to copper catalysis. The oxidation of the juice of apples, lettuce, and peaches was found to be partly due to copper. HCN inhibited 90 percent of the oxidation produced by yellow squash and only 50 percent of the oxidation by cabbage juice, but the addition of $CuCl_2$ did not increase appreciably the rate of oxidation. Glutathione failed to inhibit the oxidation by yellow squash.

It is concluded that hemochromogens are probably the chief catalysts for the oxidation of ascorbic acid in those biological fluids possessing no inhibitory mechanism.

The catalytic oxidation of ascorbic acid, A. E. Kellie and S. S. Zilva (*Biochem. Jour.*, *29* (*1935*), *No. 5, pp. 1028–1035*).—The spontaneous oxidation of ascorbic acid in tap water, ordinary laboratory distilled water obtained from a tin-lined copper still, water redistilled from glass apparatus, and water distilled from and received in quartz apparatus was investigated by indophenol titration of solutions of *l*-ascorbic acid prepared by dissolving 15 mg of the acid in 40 cc of water and adjusting the pH to 7.4 by the addition of sodium hydroxide. The flasks containing the solution were kept at 37° C. and 5-cc samples withdrawn at various intervals for the test. The results obtained are summarized as follows:

"Ordinary laboratory distilled water contains sufficient quantities of metals (copper and iron) to catalyze the irreversible oxidation of dissolved ascorbic acid. In the very early stages of the process dehydroascorbic acid is found in quantities almost equivalent to the amounts of ascorbic acid which are oxidized, but as the reaction proceeds the quantities of the dehydrogenated acid present diminish. This catalytic action is barely perceptible when the vitamin is dissolved in water which has been redistilled several times from glass apparatus and which is used immediately or in water distilled from and received in quartz. When this water is previously saturated with oxygen the disappearance of ascorbic acid is not significantly increased. The addition of aqueous extracts of liver, kidney, muscle, spleen, large and small intestine and of plasma, intact or hemolyzed erythrocytes, and N/10 NaCl inhibits the oxidation of ascorbic acid in ordinary distilled water or in water to which iron or copper has been added. Leucocytes have no influence on the oxidation. There is a disappearance of ascorbic acid immediately after the addition of hemolyzed erythrocytes which is proportional to the quantity of the added corpuscles. This disappearance does not take place when the hemolyzed corpuscles are previously treated with carbon monoxide. It is suggested that dehydroascorbic acid has to be reduced in the organism before it can exercise antiscorbutic activity."

The interaction of peroxidase and ascorbic acid (vitamin C) in biological oxidations and reductions, H. Tauber (*Enzymologia*, *1* (*1936*), *No. 4, pp. 209–212*).—A method is described for the preparation of a peroxidase solution from horseradish which is capable of rapidly oxidizing ascorbic acid. The activity of the undialyzed peroxidase solution remained after 6 mo. of storage in the cold. After dialyzing, the solution changed from light brown to colorless and lost all of its ascorbic acid oxidizing property. The addition of small amounts of quinone-forming compounds, such as vanillin and *p*-phenylenediamine, and a cold extract of suprarenal glands restored the activity.

Absorption rate of oxygen by orange juice: Effect of catalysts, C. W. Eddy (*Indus. and Engin. Chem.*, *28* (*1936*), *No. 4, pp. 480–483, figs. 2*).—In this contribution from the U. S. D. A., Bureau of Chemistry and Soils, a study was made at Los Angeles, Calif., of the part played by oxygen in the oxidation of ascorbic acid contained in orange juice and the effect of each of four

catalysts on the reduction process. In the presence of oxygen the ascorbic acid content of California Valencia orange juice diminished, and when the reducing factor disappeared the absorption of oxygen practically ceased. The oxygen absorption was accelerated by the presence of 20 p. p. m. of copper salts, to a less extent by zinc, and to a slight extent by stannous and stannic salts. Approximately the same rate of absorption and a proportionate increase in the absorption of oxygen resulted when an ascorbic acid preparation was added to the filtered orange juice.

A note on the reversible enzymic oxidation of d-gluco-ascorbic acid, S. S. Zilva (*Biochem. Jour., 30 (1936), No. 7, p. 1215*).—It is noted briefly that inactive *d*-glucoascorbic acid can also be dehydrogenated by the enzyme previously shown to be present in apple juice and capable of dehydrogenating *l*-ascorbic acid.[8] "The experiment, therefore, suggests that the enzymic dehydrogenation of these compounds takes place independently of their stereochemical structure and of their biological activity."

Duality of the reversibly oxidized forms of vitamin C and the polarization of its dienol group, N. Bezssonoff and M. Woloszyn (*Nature* [*London*], *139 (1937), No. 3515, p. 469*).—The reversible behavior of the blue and green solutions obtained by treating ascorbic acid with phosphomolybdic acid is described. It is noted that phosphomolybdic acid gives identical color reactions with hydroquinol but not with pyrogallol or various other polyphenols. With catechol, which resembles ascorbic acid in having the group COH : COH, a distinct yellow color is produced. It is concluded that the dienol groups of vitamin C and hydroquinol are subject to a common influence, polarization, which does not distinguish the enol groups of catechol or pyrogallol.

The chemical nature of "ascorbic acid oxidase", E. H. Stotz, C. J. Harrer, and C. G. King (*Science, 86 (1937), No. 2219, p. 35*).—In this brief preliminary report evidence leading to the conclusion that the action of so-called enzymes in catalyzing aerobic oxidation of vitamin C can be fully explained by the catalytic action of copper is summarized as follows:

"The copper content of the 'enzymes' from squash and cauliflower is sufficient to account for the observed catalysis, and the greater part of the Cu in such preparations is found in the coagulated protein upon heat inactivation; mixtures of copper salts with albumin exhibit properties like those of the postulated enzymes with respect to catalysis, inhibition, heat and acid activation, optimum pH and stability; seven different copper inhibitors, both organic and inorganic, have the same relative effects upon pure copper compounds, copper-protein mixtures, and the enzymes; copper biuret exhibits a catalytic effect that is equivalent, atom per atom, to that of simple copper salts."

In view of these findings the authors suggest that "there is no further need for using such terms as ascorbic acid oxidase, 'vitamin C oxidase', and 'hexuronic oxidase' in the literature, at least in the sense that they have been used in the past."

A study of "ascorbic acid oxidase" in relation to copper, E. Stotz, C. J. Harrer, and C. G. King (*Jour. Biol. Chem., 119 (1937), No. 2, pp. 511–522, figs. 3*).—This is the complete report, with experimental data, of the investigation noted above from a preliminary report.

The determination of ascorbic acid as furfural and a comparison of results obtained by this method and by indophenol titration, J. H. Roe (*Jour. Biol. Chem., 116 (1936), No. 2, pp. 609–619*).—"A method for the determination of

[8] Biochem. Jour., 28 (1934), No. 2, pp. 663–[illegible], fig. 1.

ascorbic acid as furfural has been developed for plant and animal tissues. The method consists essentially of the determination of the furfural formed by boiling an acid extract of a tissue in which the ascorbic acid has been oxidized, by passage through norite, with HCl alone and with HCl containing $SnCl_2$. The value obtained with the $HCl-SnCl_2$ mixture minus that given with HCl alone is the amount of furfural from ascorbic acid. Furfural is determined by the color formed with aniline, stabilized with $SnCl_2$ and proper amounts of acetic acid."

Data are reported on the recovery of ascorbic acid when added to vegetable and animal tissue and on the comparative ascorbic acid values obtained by the furfural and indophenol methods. The recoveries were considered quantitative, the range being from 94 to 105 percent. The results obtained by the two methods agreed within the limits of experimental error for every material tested except liver, the indophenol value for which was 25 percent higher than the furfural value. The close agreement in values obtained by the two methods is thought to indicate that ascorbic acid exists in both plant and animal tissues in the reduced form.

"The furfural colorimetric method is of value for its high degree of specificity, for the determination of ascorbic acid in tissues to which the indophenol titration procedure may not be applied, and as a method for determining dehydroascorbic acid."

The availability of the carbohydrates and fats of the green leaf, together with some observations on crude fiber, M. K. Horwitt, G. R. Cowgill, and L. B. Mendel (*Jour. Nutr., 12 (1936), No. 3, pp. 255–273*).—In continuation of the study noted on page 722, the authors present a method for determining the available carbohydrate of a food, based upon the ability of an active maltase which converts maltose to glucose if the concentration of maltose in the substrate is not more than 0.25 g per 100 cc. A commercial preparation of takadiastase, which will liquefy 2,700 times its weight of starch in 10 min. and which contains little if any reducing sugar, was used in the tests. The enzymatic procedure for determining the crude fiber of spinach when compared with the A. O. A. C. method (E. S. R., 76, p. 747) yielded residues more than 3 times as much as those obtained by successive treatment with acid and alkali characteristic of the conventional crude fiber method.

A method is presented for estimating the true fat content of the ether-soluble fraction of a food material. When applied to spinach more than 55 percent of the material obtained by ether extraction and sometimes called "fat" was found to be indigestible.

A simple method for the detection of copper in alloys, B. L. Herrington and J. G. Brereton (*Jour. Dairy Sci., 20 (1937), No. 4, pp. 197, 198*).—This note from the [New York] Cornell Experiment Station describes a simple test method based on the fact that copper chloride imparts characteristic blue and green colors to a nonluminous flame. The test paper consists of fine sandpaper strips impregnated with pure ammonium chloride. The metal to be tested is rubbed with a strip of the test paper until a black smudge appears on the rough surface. The smudge end of the paper is then burned in a nonluminous flame (bunsen or alcohol lamp). When the yellow flame caused by the burning paper disappears the flame next to the charred end of the paper will be tinged azure blue if copper is present. This test has given good results even in the hands of amateurs.

Dissimilation of glucose by heterofermentative lactic acid bacteria, M. H. Nelson and C. H. Werkman (*Jour. Bact., 30 (1935), No. 6, pp. 547–557*).—Carbon and oxidation-reduction balances for the fermentation of glucose by three

species, representative of the heterofermentative lactic acid bacteria, were determined in an investigation carried out at the Iowa Experiment Station.

"Lactic, acetic, and carbonic acids, ethyl alcohol, and glycerol were found as end products. The millimols of carbon dioxide produced were equivalent to the sum of the acetic acid and ethyl alcohol. The glycerol produced was equivalent to twice the millimols of acetic acid."

A probable series of breakdown products in the dissimilation of glucose by the heterofermentative lactic acid bacteria is suggested.

AGRICULTURAL METEOROLOGY

Weather rambles, W. J. HUMPHREYS (*Baltimore: Williams & Wilkins Co., 1937, pp. [5]+265, [figs. 37]*).—Keen observations on weather in some of its unusual moods and manifestations, as well as on some of the commoner but not necessarily better understood phenomena of dew, rain, frost, snow, drought, and wind and dust storms, are discussed in this pleasantly discursive but none the less soundly scientific little book.

World weather, VI, G. T. WALKER and E. W. BLISS (*Mem. Roy. Met. Soc. 4 (1937), No. 39, pp. 119–139, figs. 19*).—This is a continuation of previous studies (E. S. R., 69, p. 13), dealing primarily with the winter seasons of the North Atlantic and North Pacific Oceans and with winter and summer seasons of the southern oscillation. In the previous studies fluctuations of pressure, temperature, and rainfall in the winter in the region of the North Atlantic were studied as a connected system. In the study here reported a similar system is "shown to hold in the spring, summer, and autumn. But the amount of persistence is small, so that the results are of little value for foreshadowing weather; nor does a consideration of the trade wind region lead to success in this respect. Similarly the southern oscillation which was found active in the summer and winter seasons over a large part of the globe is now shown to function in the two remaining seasons, and, while that of March to May has little control over the following quarter, the southern oscillation of September to November has a correlation coefficient of 0.9 with the oscillation of December to February. Thus there are a number of relationships of between 0.6 and 0.82 available for foreshadowing weather."

Snow structure: Some practical applications, G. SELIGMAN (*Quart. Jour. Roy. Met. Soc. [London], 63 (1937), No. 268, pp. 93–103, pls. 6, figs. 2*).—This article explains the characteristic structure of snow and influences affecting its formation and behavior. It is stated that "it is only of recent years that a systematic study of snowcraft has been taken up, and much work in a rich field lies ahead of the investigator. The newly formed International Commission of Snow has as one of its objects the encouragement of a scientific study of these and kindred questions and the dissemination of the knowledge so obtained."

The nature of snow, G. SELIGMAN (*Roy. Inst. Gt. Brit. Proc., 29 (1936–37), pt. 3, No. 138, pp. 465–488, pls. 6*).—Substantially noted above.

Snow surveys for the purpose of forecasting stream flow, R. C. FARROW (*Forestry Chron., 13 (1937), No. 1, pp. 271–283, pl. 1, figs. 5*).—The degree of success attained in snow surveys in southern British Columbia as a means of forecasting water supply for irrigation, power, and other purposes is reported upon in this article. Conditions which militate against the accuracy and reliability of the forecasts are also discussed.

Areas of intense drought distress, 1930–1936, F. D. CRONIN and H. [illegible] (*Works Prog. Admin. [U. S.], Div. Social Res., Res. Bul. [illegible], 5. ser. (19*

pp. IV+54, figs. 8).—This article, the first of a series of three reports, gives in some detail the results of a study of social aspects of the drought problem cooperatively made by the Division of Social Research of the Works Progress Administration, the U. S. D. A. Bureau of Agricultural Economics, and the Resettlement Administration. It is stated to be a preliminary effort to delineate areas of varying degrees of drought intensity and to select carefully defined sections as the basis for further study. It deals in general with the problem of drought and describes conditions as related to drought in the Great Plains region. It discusses drought incidence in the Great Plains region, misdirected agricultural expansion, the measure of drought effect, rainfall, crop conditions, pasture conditions, number of cattle, Federal aid, combined indices of drought intensity, and type-of-farming areas. The area studied included all or parts of Colorado, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming.

Climatological summary for 1935, C. A. PATTON (*Ohio Sta. Bul. 579 (1937), pp. 133–139*).—The usual tabular summaries of data on temperature, precipitation, and frost-free periods are given for the station at Wooster and for Ohio in general. Extremes of rainfall and temperature characterized weather at the station during the year. Rainfall in April was the least and in July and August the greatest on record in 48 yr. The total precipitation, 46.82 in., for the year was the greatest since 1913. The average temperature for the year was 49.6° F., which is very close to the normal. The highest temperature was 93° July 19, the lowest −8° December 31. The last killing frost in the spring was on April 18, the first in autumn on September 30, giving a growing season of 165 days. The number of clear days was 130. The total snowfall was 30.2 in.

SOILS—FERTILIZERS

[Soil investigations at the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 393 (1937), pp. 194–199*).—These have included work on the soil erosion survey, nitrogenous fertilizer and soil acidity, potato soils in Connecticut, agronomic significance of soil tests, relation of site quality of oak stands to soil properties, benefits of litter cover for soil structure, effect of fertilizing tree seedlings, and soil fertility experiments with vegetable crops, including effect of soil amendments on sandy plats.

[Soil investigations, Nebraska Station] (*Nebraska Sta. Rpt. [1936], pp. 16–19*).—Soil moisture; restoration of organic matter in soils; nitrification in Nebraska soils; influence of commercial fertilizers, manure, and lime on yields on Carrington clay loam; factors affecting permeability of soils, including subsoiling tests; and availability of phosphorus in alkaline soils are briefly dealt with.

The nature and properties of soils, T. L. LYON and H. O. BUCKMAN (*New York: Macmillan Co., 1937, 3. ed., pp. XIII+392, figs. 45*).—The present edition of this widely known textbook, prepared at Cornell University, differs but little from that of 1929 (E. S. R., 62, p. 810), which is here brought up to date.

The contents are: A fundamental concept of the soil; the supply and availability of plant nutrients in mineral soils; the physical properties of mineral soils; colloidal clay and ionic exchange; the organisms of the soil; the organic matter of mineral soils; forms of soil water and their plant relations; soil-moisture losses and their control; the origin and classification of soil materials; soil formation, classification, and survey; the nature and utilization of organic soils; the soil reaction—soil acidity and alkalinity; liming the soil;

the nitrogen economy of soils; fertilizers and fertilizer practice; farm manure and green manure; the methods of fertility maintenance for mineral soils; author index; and subject index.

Soil conditions and plant growth, E. J. RUSSELL (*London and New York: Longmans, Green & Co., 1937, 7. ed., pp. VIII+655, pl. 1, figs. 65*).—The author notes in his preface to the present edition that in visits to many European experiment stations, including those of Poland and Russia, and also from papers and discussions of the Third Congress of the International Society of Soil Science and from other sources, "I have accumulated a considerable amount of material, and I have selected from it whatever seemed suitable for the present edition [E. S. R., 67, p. 108]. The changes are so considerable that much of the book has had to be rewritten."

To make space for the new material, reduction has been effected in some other parts of the book, as "it is intended to be read, not merely consulted like a dictionary." The appendix on analytical methods has been replaced by a brief list of references to sources of the necessary methods. The bibliography has been curtailed rather than enlarged, in view of the present availability of bibliographies more complete than an appendix to such a textbook could contain.

Land classification in Wisconsin, A. R. WHITSON (*Amer. Soil Survey Assoc. Bul. 16 (1935), pp. 39–41, figs. 3*).—A note contributed from the Wisconsin Experiment Station proposes four grades of productivity for staple food crops; the further consideration in land grading of climatic factors; a four-grade, semi-quantitative classification with respect to stoniness; a slope classification into lands of less than 10 percent, from 10 to 15, from 15 to 30, and more than 30 percent; and a grading with respect to degree of erosion. On the basis of these criteria, it was found possible to set up four grades of general land value for agricultural use. Choice of lands for forestry is made on a separate and quite different basis.

A pedologic study of some soils in New Jersey, J. S. JOFFE (*Soil Sci., 43 (1937), No. 3, pp. 221–238*).—In a contribution from the New Jersey Experiment Stations the author discusses some relations of the geographic-geologic features, the topography, and the climate of a number of soil profiles in New Jersey.

The variations in the depth of the profiles and the constitution of 13 soils are analyzed pedologically, and the agrological inferences are discussed; the relation of the erosion problem to the profile constitution is noted; chemical analyses of 13 soil profiles are discussed in the light of the processes involved in the formation of these profiles; and some agrological aspects of the profile studies are taken up with special reference to calcium, magnesium, and phosphorus.

The variety of solonetz red soils in the vicinity of the village of Marcopoulo, Attica, K. I. NEVROS and I. A. ZVORYKIN (*Soil Sci. 43 (1937), No. 3, pp. 239–246*).—"In the vicinity of the village of Marcopoulo there is a solonetzic $CaCO_3$-free red soil of very ancient origin in which the soil-forming process is directed toward laterization, as is indicated by the total analyses of the soil and the clay. The soil-forming process here is complicated by the influence of absorbed Na.

"The solonetzic properties of the soil are apparent from the morphologic study of the profile and are strongly marked in the structure of horizons B and B_1. Horizon A_1+A_2 is also very typical of a solonetzic soil, being considerably bleached and impoverished of the clay fractions when compared with the underlying horizons. The dark spots and smears, as well as the occasional

small dark concretions and the light gray veins, prove the influence of the ground waters on the process of soil formation. The existence of this influence is confirmed by the considerable quantities of absorbed Na, as well as by the presence of chlorides and sulfates, found in the water extract. Thus this is an example of 'underground' salinization of red soil. The process of natural desalinization has progressed appreciably, and apparently this is a case of solonetz solodization. This is, therefore, a relic formation."

Water-supplying power and water-absorbing power of soils as related to wilting of wheat and coleus in greenhouse pot cultures, B. E. LIVINGSTON and W. L. NOREM (*Soil Sci., 43 (1937), No. 3, pp. 177–204, figs. 5*).—Extending a number of previous investigations by Livingston (E. S. R., 38, p. 522) and various coworkers, the authors now state a part of their current observations of advanced wilting and of soil conditions associated with it as follows:

"Our numerical results with soil-point cones furnish additional support to the conclusion that that instrument promises to be exceedingly useful whenever the dynamic water relations between plant and soil are to receive attention. It is again emphasized that ordinary plants respond, in their subterranean water relations, directly to the water-supplying power of the soil adjacent to their absorbing roots, rather than to soil suction or to soil-moisture content referred to moisture equivalent, water-holding capacity, hygroscopic coefficient, or other such static soil characteristics that represent internal soil surface, etc. Of course these static characteristics of a soil determine its water-supplying power at any specified temperature, but supplying power is the environmental feature that directly limits the rate of water absorption *and it may be measured and studied quantitatively for the purposes of* physiology without reference to the static characteristics of the soils considered.

"The attainment by a drought-affected plant to a critical stage of wilting, *such as the onset of permanent wilting*, is again shown as corresponding to a critical water-supplying-power value of the soil about the roots—a value that is essentially the same for soils of greatly different static properties. When the coleus and wheat plants of these experiments were all in essentially the same advanced stage of wilting, the water-supplying power at the 5–7-cm depth was essentially the same for the sixteen different soil mixtures studied whether the soil was light or heavy, whether its volumetric water-holding capacity was 50 percent or above 90 percent.

"Some evidence was found, however, to support the proposition that soil composition with reference to loam, humus, and sand content, which is a static soil feature, may in some instances exert a very minor influence on the critical water-supplying-power value that corresponds to a critical advanced stage of plant wilting. That proposition is not yet well established and it calls for further study.

"A new device for quantitatively estimating the water-absorbing power of a soil mass at any desired depth and from time to time, without disturbing the soil after the instrument is installed, proved highly promising. A Livingston porous-porcelain irrigator cone [E. S. R., 41, p. 681] remains permanently in the soil, at any specified depth. It is temporarily filled with water for a short time while each reading is being made, but it remains empty at other times. Readings of the rate of water loss for 1 hr. are obtained by means of a burette, a mercury barostat being introduced between burette and cone. For the critical stage of wilting considered, there was generally a constant proportionality between water-absorbing-power readings of the irrigator device at the 9–15-cm depth and corresponding water-supplying-power readings of soil-point cones at the 5–7-cm depth."

Some soil moisture relationships of the Wooster silt loam, R. Bradfield and F. S. Howlett (*Ohio Sta. Bul. 579 (1937), pp. 30, 31*).—Data are concisely summarized.

Electrodialysis and cation exchange studies on soils of varying organic matter content, A. L. Prince and S. J. Toth (*Soil Sci., 43 (1937), No. 3, pp. 205–217*).—The authors report from the New Jersey Experiment Stations an investigation of the effect of the content of organic matter upon titratable acids and bases, upon ultimate pH, upon cation exchange capacity, and upon mobilization of iron and silica.

It was shown that "the quantity of bases electrodialyzed is not a function of the pH of the field sample, but rather depends upon the total cation exchange capacity and the degree of base saturation. The total dialyzable acids and bases were greater on the limed than on the unlimed plats, and still greater on those plats receiving manure and lime. The bulk of the bases and acid were delivered in 14 hr.

"The addition of organic matter and phosphorus to the soil increased the acidoid-basoid ratio of the soil complex, and consequently lowered the ultimate pH and increased the cation exchange capacity. Thus the plats receiving manure showed a decrease of approximately 0.4 to 0.6 pH unit and an increase in cation exchange capacity of about 4 m. e. [milliequivalent] per 100 g of soil. Mobilization of iron and silica increased with decreasing ultimate pH.

"Electrodialysis reduced the cation exchange capacity of all samples, the greatest loss occurring with the samples from plats receiving manure and lime. This was explained on the basis that during electrodialysis acidoids were hydrolyzed, and also that a certain fraction of the soil complexes mobilized and precipitated in the cathode chamber. The average silica-iron ratio in the dialyzate from the anode was higher than that from the cathode. The degree of the decomposition of the organic matter was found to influence the colloidal properties previously listed, i. e., with the cylinder soils receiving undecomposed rye straw only slight effects were noted. It was found that after electrodialysis a pH gradient varying from 4.3 near the anode to 5.0 at the cathode existed in the soil compartment. An analysis of the sediment appearing in the cathode dialyzates showed that the material was predominantly basic and had a low cation exchange capacity. Organic matter and manganese, as well as appreciable quantities of calcium and magnesium, were also found in the sediment."

Behavior of legume bacteria (Rhizobium) in relation to exchangeable calcium and hydrogen ion concentration of the colloidal fraction of the soil, T. M. McCalla (*Missouri Sta. Res. Bul. 256 (1937), pp. 44, pls. 6, figs. 14*).—A bacteriological medium which simulated soil conditions was prepared by use of electrodialyzed colloidal clay. The conditions were thus made chemically and bacteriologically controllable and were very similar to soil conditions.

"In the presence of an ample supply of calcium, normal legume bacteria remained normal and abnormal or so-called variant forms became normal. All of these, after growth with ample calcium, gave good nodulation on plants supplied with calcium. In the absence of calcium, the normal legume bacteria became abnormal, and the abnormal forms remained abnormal. Both failed to nodulate the host plant. The best nodulation was secured when both the bacteria and the plants were given calcium. No nodulation occurred when neither the bacteria nor the plants received calcium." The order of importance of the elements named as nutrients for legume bacteria appeared to be as follows: Ca-Mg-Ba-K-H. Growth of the bacteria was related to the amount of calcium

present in the media. For the best growth of the legume bacteria it was necessary to have the clay at least 50 percent saturated with calcium.

Anaerobic bacteria capable of fermenting sulfite waste liquor, A. M. Partansky and B. S. Henry (*Jour. Bact., 30 (1935), No. 6, pp. 559–571*).—Five new species of the genus *Clostridium* were isolated from water-covered muds and a soil sample and named *C. polyfermenticum* (nine strains), *C. saccharophilicum* (three strains), *C. saccharopetum* (one strain), *C. saccharopostulatum* (two strains), and *C. sartagoformum* (three strains).

"Taken as a group the new species are characterized by their unusually diversified and vigorous saccharolytic action and by the complete absence of any proteolytic action. . . . Their most outstanding characteristic is the ability to grow in and ferment s[ulfite] w[aste] l[iquor] in dilutions up to 40 to 50 percent of liquor, when the latter contains some nitrogenous material, e. g., 0.2 percent beef extract. Butyric and acetic acids and considerable amounts of gas are produced under these conditions.

"Morphologically *C. polyfermenticum*, *C. saccharophilicum*, *C. saccharopetum*, and *C. saccharopostulatum* resemble each other closely, but differ markedly in this respect from *C. sartagoformum*. They are best distinguished from one another on the basis of colony characteristics and, particularly, on the basis of their fermentation reactions."

Sampling soil for the pH determination, A. H. Eddins and W. H. Scoville (*Soil Sci., 43 (1937), No. 3, pp. 219, 220, fig. 1*).—The authors describe a tool designed for the sampling of Florida sands. The sampling tube proper consists of two longitudinal segments of 1½-in. steel tubing hinged together by a bolt and so attached to the spring-steel loop handle that the blades open for the release of the sample when the handle is compressed. The blades are sharpened at their opened ends to facilitate penetration of the soil.

"The sampler and the procedure described for the preparation of the samples for the pH determination are particularly adapted for use in those sections of the country where the soils are similar to the sandy types of Florida, but could not be used successfully where the soils have a clay texture or contain gravel or stones."

Comparison of various chemical quick tests on different soils, M. S. Anderson and W. M. Noble (*U. S. Dept. Agr., Misc. Pub. 259 (1937), pp. 24, figs. 3*).—"Comparable tests were made upon a group of widely diversified soils with several of the widely used commercial soil-testing sets. The soils used were virgin samples of Barnes silt loam, Carrington silt loam, Clinton silt loam, Miami silt loam, Cecil clay loam, Ruston loamy sand, and Caribou loam. The tests, made independently by two operators, were for available phosphorus and potassium and for acidity, lime requirement, and nitrates. The sets used were the Simplex, Emerson, LaMotte, Sudbury, and Hellige, and the test sets made by the Urbana [Illinois] laboratories and that made and used by the Indiana . . . Experiment station. Some of the laboratory tests not used commercially were included. The results obtained by two observers with the same set on a particular soil were in fairly good agreement, but results by different methods on the same soil were in much poorer agreement." The data show the general trend of results that may be expected when different test sets are used on various soils. No study of actual crop response on these soils when treated to correct the indicated deficiencies was attempted.

"In many State experiment stations chemical tests have been found a valuable aid for the diagnosis of soil needs when interpreted by trained agronomists in possession of information regarding the response of various crops grown on different local soils after application of fertilizers. The use of any one of

these tests is neither recommended nor condemned. They are thought to be of particular value under certain circumstances, but the scope of their usefulness is not yet clearly defined. . . . It is realized that further investigations must be made, especially of diversified soils growing crops in response to various fertilizer treatments."

The variance of methods of testing for phosphorus on soils previously treated with different phosphate fertilizers, M. F. Morgan (*Amer. Soc. Agron., Com. Fert. Proc., 1 (1935), pp. 45–51*).—At the Connecticut [New Haven] Experiment Station the author carried out a comparative investigation of various methods for testing the availability of phosphatic fertilizers after these fertilizers had been for some time in contact with the soil. The results were checked by control experiments with two tobacco crops in pots.

The author found, in part, that "both the Truog procedures [E. S. R., 64, p. 312] and the extraction with N/2 acetic acid showed highest availability from rock phosphate, although this material was quite unavailable on this soil as measured by crop response. All of these extracting solutions are 3 pH or lower in acidity and are thus capable of dissolving large amounts of phosphorus from such a substance, although in the soil it has remained inert. The writer's usual method of passing the Universal soil extracting solution [E. S. R., 73, p. 746] directly through the soil mass has given results in better correlation with crop response than with half an hour's digestion of the soil before filtering. The latter procedure may attack a larger percentage of the fertilizer residues remaining in the soil in an unaltered form."

From further observations cited, "it is apparent that the form in which phosphorus has been applied must be definitely taken into consideration in the interpretation of phosphorus tests. Perhaps the true condition of phosphorus availability in a soil treated with rock phosphate lies somewhere in between the pictures given by the Universal and the Truog methods. In working with half normal acetic acid extracting solutions brought to different pH levels with the addition of sodium acetate, a sharp break in the solubility of rock phosphate occurs at approximately 4 pH. Above 4.5 the solubility remains practically constant at the very low value indicated by the regular Universal test."

The value of rapid soil testing methods, C. H. Spurway (*Canner, 84 (1937), No. 15, p. 16*).—The present values and limitations of chemical testing for soil nutrient deficiencies are very briefly indicated in a note contributed from the Michigan Experiment Station.

Some considerations concerning the practical interpretations of soil test results, C. H. Spurway (*Amer. Soc. Agron., Com. Fert. Proc., 1 (1935), pp. 102–106, fig. 1*).—The author of this contribution from the Michigan Experiment Station points out that "in order for any system of soil testing to attain its greatest practical value, certain conditions must be satisfied as follows: (1) Standards of coincidence of factors and fertility levels should be established for the various crops under the practical conditions of production. (2) The soil tests should show the coincidence of factors and the fertility level in any soil, and hence indicate how the soil should be treated in order to bring it nearer to the standard required by a certain crop.

"The single factor of soil fertility of immediate importance to the crop grower is the most limiting factor, whatever it may be. The most limiting factor, however, may not be a chemical factor. It may be either an excess or deficiency of water, an unfavorable physical condition of the soil, or an unfavorable climatic condition. The possible occurrence of these limiting factors, however, should always be considered in the practical interpretation of soil test results.

"Chemical soil tests should indicate what the most limiting chemical factors, excesses or deficiencies, may be in the order of their occurrence in the whole coincidence of chemical plant growth factors in a soil. Any other procedure in the use of soil testing methods is open to the criticism that the most limiting factor may be overlooked. Until standards of coincidences and best fertility levels shall have been established for cultivated crops, on the basis of the soil *testing system* used, soil test results can be interpreted only as indications of excesses or deficiencies. The proof lies in the effects produced on the crop by the soil treatments used to correct the unfavorable soil condition."

The application of rapid chemical tests, E. K. Walrath (*Amer. Soc. Agron., Com. Fert. Proc., 1 (1935), pp. 86–93, figs. 3*).—The author discusses the value of chemical tests for soil needs from the viewpoint of the sale of commercial fertilizers.

"Demand by members for more definite information about their individual soils and fertilizer needs was largely responsible for the use of the rapid chemical tests by the Eastern States Farmers' Exchange. When used to supplement experimental data, extension service recommendations, and the field experience of the staff, these tests remove much of the guesswork from recommendations."

Results of rapid tests applied to soils of known fertilizer treatment, D. M. Goss and A. L. Prince (*Amer. Soc. Agron., Com. Fert. Proc., 1 (1935), pp. 94–101*).—The authors report from the New Jersey Experiment Stations that "rapid soil tests have been used not only as an aid in giving fertilizer and lime recommendations to those landowners in the State who desire such information, but also to show the changes taking place, or that have taken place, in the various field and cylinder experiments carried on by this station. Morgan's Universal soil testing system [E. S. R., 73, p. 746], with minor modifications, has been used exclusively."

Slight changes in Morgan's procedure in measuring out samples of the soil extract and in the tests for manganese, for phosphates, for potassium, and for calcium are described. For determining soil reaction a form of glass-electrode apparatus was found most satisfactory.

What rapid tests have shown about Indiana soils, S. D. Conner (*Amer. Soc. Agron., Com. Fert. Proc., 1 (1935), pp. 52–62, fig. 1*).—Of the potassium and phosphate tests in use at the Indiana Experiment Station the author states, in part, that "our test will detect raw rock phosphate entirely too easily. Some investigators get around this by using very weak solvents. We wish to keep the test rapid, however, so we try to dissolve in 1 min. what it takes the crop 6 mo. or more. Our phosphate test tends to run too high on light sandy soils and subsoils. Fortunately it applies very well to about three-fourths of our Indiana soils. We depend on experience to interpret the other one-fourth.

"The potash test appears to have fewer exceptions than the phosphate test. It measures exchangeable potash very well. . . . There is one caution to be followed in judging the potash needs of a soil by any test of a soil sample. That is, how *far can the roots of the plants go for potash?* Quite often the subsoil potash is very available, and if the plants can root deeply they can get along with very little potash in the surface soil. . . . Subsoil phosphate, unfortunately, is much less available than the subsoil potash."

The author notes in conclusion that "the rapid tests show only one factor in soil productivity. The other factors that go to make up fertility must be measured by other means. They are a very valuable addition to our methods of diagnosing the needs of crops and soils."

Reactions of basic materials in fertilizer mixtures, W. H. Ross and K. C. Benson (*Amer. Soc. Agron., Com. Fert. Proc., 1 (1935), pp. 24–32, figs. 4*).—The

authors briefly outline the types of reaction occurring in the preparation of physiologically neutral fertilizer mixtures. "These reactions are accompanied by changes in the physical as well as in the chemical properties of the mixture. Thus as a result of chemical reaction a mixture may cake or become sticky, it may become more hygroscopic or even less hygroscopic, its free moisture content may change, the availability of its plant-food content may increase or decrease, and the mixture as a whole may decrease in weight due to the evolution of volatile matter such as carbon dioxide." The chemical and physical effects of ammonia, calcium cyanamide, limestone, dolomite, calcined phosphate, basic slag, and blast furnace slag are individually discussed.

The value of different basic materials and of dolomitic limestone of different degrees of fineness in the production of non-acid-forming fertilizers, J. R. Taylor, Jr., and W. H. Pierre (*Amer. Soc. Agron., Com. Fert. Proc., 1 (1935), pp. 15–23, fig. 1*).—The results of experiments reported from the West Virginia Experiment Station show, in part, that "the soils which received the fertilizer containing no basic supplement became very acid as a result of the fertilizer treatment. (The Wheeling silt loam soil had an original pH of approximately 5.1 and the Wheeling fine sandy loam of pH 6.1). Even under such acid soil conditions (pH 4.28–5.05), however, colloidal phosphate and high-grade rock phosphate had little or no appreciable effect in neutralizing soil acidity." Slag, quenched or unquenched, and dolomitic limestone were distinctly more effective. It was found also that "the production of calcined phosphate from rock phosphate, by which most of the phosphorus becomes citrate soluble, causes approximately two-thirds of the calcium to become readily reactive in neutralizing soil acidity."

The rate of reactivity of dolomite from various sources and of varying degrees of fineness as determined by chemical methods, H. B. Siems and H. C. Batton (*Amer. Soc. Agron., Com. Fert. Proc., 1 (1935), pp. 10–14*).—The authors determined, at 10-min. intervals after adding the acid, the extent of the neutralization of 22 cc of N hydrochloric acid by a 1-g sample of the dolomites from various sources and of several degrees of fineness of grinding.

"The results obtained seem to indicate . . . that although fineness of grinding may be an important factor in determining the rate of reactivity of dolomite, the source from which the dolomite is obtained may be equally important."

Relative value of dolomite and raw phosphate as neutralizers of acid fertilizers as affected by a modified Neubauer cropping.—Preliminary report, H. L. Cook and S. D. Conner (*Amer. Soc. Agron., Com. Fert. Proc., 1 (1935), pp. 4–9, figs. 4*).—This preliminary report states the first results obtained in an investigation carried out at the Indiana Experiment Station. A Miami sandy loam subsoil (Indiana), pH 4.8, and a Norfolk fine sand, pH 5.4, were tested by a method described, in part, as follows:

"Barley, rye, oats, wheat, and corn were grown with various treatments and then a final crop of barley without treatment to measure accumulative effects. The crops were grown in Neubauer dishes with 800 g of soil run in triplicate. . . . A crop was planted very thickly, then removed, and the soil thoroughly leached to imitate heavy rainfall during several months in the field. New fertilizer was added, another crop grown, removed, and the soils leached. After five such treatments, one crop was grown without additional fertilization to get residual effect, then the soil removed and mixed. Analyses were then made on soils from each treatment. Whether this series of treatments would exactly duplicate or not the effects obtained in several years of cropping, fertilization, and weathering in the field is not so important. It was hoped, however, that in the short time allowed for the work it would give similar

results." Soil acidity was determined by each of two methods. The percentage of saturation with bases was determined by electrometric titration of an ammonium acetate solution extract. The pH values were determined in water suspensions and in suspensions in normal potassium chloride solution.

The results obtained with each of the two soils are separately summarized in some detail and with general indications as follows:

"With the exception of the Hopkins acidity on the Miama sandy loam, there was a significant similarity trend of results between various treatments on both soils. On the Norfolk sandy loam the better nitrification may be the reason why the raw rock phosphate showed negative effects by pH and percentage saturation. There was in all cases better nitrification with the fine dolomite, the *calcium carbonate, the tricalcium phosphate, and the calcium silicates* than with the fertilizer alone, or fertilizer neutralized with raw phosphates." The finely ground dolomite and the ground calcium silicates were the best neutralizers for both soils, the quenched calcium silicate (molten slag poured into water) being slightly better than the raw (cooled and ground) silicate in one of the two cases.

The influence of fertilizer constituents and leaching on the acidity of soil-fertilizer mixtures, L. G. Willis and J. R. Piland (*Amer. Soc. Agron., Com. Fert. Proc., 1 (1935), pp. 33–37*).—These authors (North Carolina Experiment Station) state that "the initial acidity of soil-fertilizer mixtures due to 'salt effect' may have serious consequences in the early part of the season. Until this is removed by leaching it imposes an added burden on neutralizing agents, especially in cool soils. The calcium sulfate content of superphosphate contributes a great part of the salt effect. This is eliminated by leaching but probably with the loss of essential nutrient elements from the soil. The calcium sulfate content of fertilizers can probably be reduced without loss of efficiency, producing a fertilizer giving a lesser quantity of acidity to be neutralized and conserving the natural fertility of the soil. Initially the sulfate (SO_4) radical is more acidic than the phosphate (H_2PO_4), but at final equilibrium there is probably little difference between the two.

"Soluble phosphate retards the rate of reaction of dolomitic limestone in the soil.

"The acidity value of ammoniacal and organic nitrogen due to nitrification is very low in acid soils except where the fertilizer is made potentially neutral with material such as dolomitic limestone."

Acid-neutral fertilizers in vegetable crop production in eastern Virginia, J. B. Hester and H. H. Zimmerley (*Amer. Soc. Agron., Com. Fert. Proc., 1 (1935), pp. 38–43, pl. 1, figs. 4*).—According to the Virginia Truck Experiment Station, "degree of fineness of limestone is an important factor in a 'dry-mix' fertilizer in effectively maintaining the soil reaction, during the growth of a crop, against the change in reaction of the soil brought about by using physiologically acid salts in the fertilizer mixture. Dolomitic limestone to be effective in this nature should be of at least 100-mesh fineness.

"Dolomitic limestones of different origin show different degrees of activity in the soil, which is also an important factor.

"Neutral salt mixtures are effective in maintaining the soil reaction against a change caused by acid-forming materials in the mixtures."

A greenhouse study of the effects of fine limestone applied in the row with legume seed on acid soils, L. M. Greiner, R. H. Walker, and P. E. Brown (*Jour. Amer. Soc. Agron., 29 (1937), No. 2, pp. 157–165*).—Greenhouse experiments were made at the Iowa Experiment Station on the acid Marshall and Grundy silt loams. Small quantities of fine limestone in the row with sweetclover seed

on Marshall silt loam caused a depression in the early growth of the plants in deep greenhouse pots, but not with alfalfa or sweetclover on Grundy silt loam. Limestone applied in the row did not appear to depress nodule formation. The death rate of seedlings caused by pythiaceous fungi was decreased 3.4 percent for alfalfa, 3.7 for sweetclover, and 8.2 for red clover by applying fine limestone with the seed at planting. Fine limestone so applied on Marshall silt loam stimulated growth of micro-organisms. As indicated by pH determinations, penetration of limestone when applied in the row was evident in soils receiving water from below only.

Sources of nitrate of soda, R. P. Bledsoe (*Com. Fert.,* *54* (*1937*), *No. 4, p. 31*).—The Georgia Experiment Station has found natural (Chilean) sodium nitrate and a commercial sodium nitrate produced from atmospheric nitrogen to be of equal value, within limits of experimental error.

AGRICULTURAL BOTANY

Notes on types of North American grasses, A. Chase (*Amer. Jour. Bot.,* *24* (*1937*), *No. 1, pp. 33–35*).—These relate to 19 type specimens not located until after the publication of Hitchcock's Manual of the Grasses of the United States (E. S. R., 73, p. 465).

The determination of the internal gases of plant tissues, C. W. Culpepper, H. H. Moon, and J. M. Lutz (*Science,* *84* (*1936*), *No. 2183, pp. 398–400, fig. 1*).—A modification of the Orsat gas analysis apparatus is described and figured, details of procedure are outlined, and the results obtained with various fruits are presented and discussed.

Spectrographic method for determining the carbon dioxide exchange between an organism and its surroundings, E. D. McAlister (*Plant Physiol.,* *12* (*1937*), *No. 1, pp. 213–215, figs. 2*).—"The spectrographic method for the determination of carbon dioxide as here described makes use of the high opacity of CO_2 gas to radiation in one of its fundamental infrared absorption bands." Wheat was the test plant used.

The range indicator method in pH determinations of plant tissues, J. F. Stanfield (*Ill. State Acad. Sci. Trans.,* *28* (*1935*), *No. 2, pp. 113, 114*).—The method was successfully used to determine the pH values of specific tissues within the plant.

A method for growing and for making permanent slides of pollen tubes, A. V. Beatty (*Stain Technol.,* *12* (*1937*), *No. 1, pp. 13, 14, fig. 1*).—Two methods are described for growing, fixing, and staining pollen tubes (*Eschscholtzia* and *Papaver* used), which permit ready measurement of the growth rate and offer a rapid procedure for making permanent slides. A 1.5 percent agar solution with added cane sugar is the medium used. Navashin's fixative and saturated aqueous crystal violet stain, among others, gave good results. By regulating the time intervals for fixing, the different stages of nuclear division can be obtained. An airtight chamber is described for use with pollen tubes which explode on contact with air.

Recent advances in microtechnic.—I, Methods of studying the development of the male gametophyte in angiosperms, P. Maheshwari and H. D. Wulff (*Stain Technol.,* *12* (*1937*), *No. 2, pp. 61–70*).—"Among methods used for a study of nuclear details in the development of pollen grains, the following were found to be very satisfactory: (1) Warming the entire grains in acetocarmine and then clearing with chloral hydrate; (2) making smear preparations stained with crystal-violet-iodine or iron alum hematoxylin. For paraffin sections, a counterstain with dilute alcoholic erythrosin is often very

useful after the usual iron hematoxylin technic. A method of making cultures of pollen tubes on slides coated with thin films of sugar agar is described in detail. The tubes can be fixed by immersing the slide in formol-acetic-alcohol and then stained by any desired schedule. . . . For studying stages in fertilization or gametogenesis, styles should be fixed and sectioned only after a preliminary study with iodine-chloral-hydrate or safranin-anilin-blue or acetocarmine. . . .

"Some other methods that have not been tried by the authors but appear to be valuable are also briefly described." Forty-three literature references are given.

Microtechnique for winter buds, H. P. Bell and V. Facey (*Canad. Jour. Res., 15 (1937), No 4, Sect. C, pp. 129–134*).—"When preparing winter flower-bud material for microscopic examination, unbroken series of sections cannot be obtained by the ordinary methods of dehydrating, imbedding, etc. This is due to the diverse but characteristic structures found in a resting bud. These structures include heavy impervious protective scales, dense mats of hairs between the young leaves, flowers, and bracts, and a delicate embryonic tissue at the tip. A continuous series of sections may be obtained by (1) making use of extremely sharp tungsten needles to remove the more minute scales and bracts, especially those between the embryonic flowers; (2) soaking the material for at least 2 mo. in 70 percent alcohol; (3) using *n*-butyl alcohol instead of absolute alcohol and xylol; (4) keeping the material continuously at low pressures; and (5) using an alcoholic stain. Each of these additional steps helps, but all are necessary for completely satisfactory results. A method by which the special tungsten needles may be made is described. The continuous treatment at low pressures is made possible by using a 2-oz. bottle fitted with a capillary tube and stopcock. The stains which proved most satisfactory were alcoholic solutions of safranin and acid fuchsin."

A practical device for the rapid quantitative determination of plant pigments, W. A. Beck (*Science, 85 (1937), No. 2206, p. 368*).—Light from a 500-w projection lantern was transmitted through a ray filter and through a solution of chlorophyll, xanthophyll, or carotene in an absorption cell to a photoelectric cell. The current produced was measured by a microammeter. The concentration of the solution used could be determined by camparison with values obtained with graded standard solutions.

Studies on bacterial pigmentation.—II. Growth requirements, R. D. Reid (*Zentbl. Bakt. [etc.], 2. Abt., 95 (1937), No. 18–20, pp. 379–389*).—From this study by the Pennsylvania Experiment Station, it is concluded that bacterial pigmentation is governed by a variety of factors, the presence of one or several of which may be adequate to produce sufficient pigment so that the absence of some other factors will not be noted. The principal essential element is nitrogen, which may be present in forms unavailable to some chromogens. Carbohydrates increase pigmentation (probably by stimulating growth) when added to media containing a suitable nitrogen source and the essential inorganic constituents, but in the absence of the last two they are unable to support pigment production. Organic metallic compounds do not favor pigmentation. The optimum reaction is pH 6.6–8.0.

"The results obtained from this study are illustrative of conflicting results to be obtained when a large group of organisms of diverse characteristics is studied. The factors influencing pigment production in one culture may differ considerably from those affecting it in others. The preceding experiments indicate the most important factors which may influence pigmentation."

Effect of colored cellophane on the production of sun-red color in maize, W. R. SINGLETON (*Science, 84 (1936), No. 2187, pp. 488, 489*).—In this preliminary study by the Connecticut [New Haven] Experiment Station, ear shoots were excluded from light as soon as they appeared and held in this condition until September 15, when they were kept covered with cellophane bags of various colors until October 1. At this time an intense red had developed under the clear wrappings and under all the colored ones except the dark red. The exact wavelengths most effective in inducing production of the red pigment have not yet been determined, but it is evident that red light alone is not responsible.

[Evaporation records] (*Ohio Sta. Bul. 579 (1937), pp. 38, 39*).—Reports are given on evaporation at Wooster in 1936 and its relation to crop yields, and on evaporation in greenhouses, both by J. D. Wilson.

The relation between rate of transpiration and rate of absorption of water in plants, P. J. KRAMER (*Amer. Jour. Bot., 24 (1937), No. 1, pp. 10–15, figs. 6*).—Using Livingston auto-irrigator cones in pots in the greenhouse and outdoors, transpiration, as determined periodically throughout the day for green ash, tulip poplar, loblolly pine, black willow, cactus, and sunflower, was found to exceed water absorption during the day and the reverse at night for all the plants tested except *Opuntia*, in which maximum transpiration occurred from 6 to 10 p. m. rather than near midday as in the rest. Absorption lagged behind transpiration about the same in all. At night stomatal closure checked transpiration abruptly, but absorption did not drop off as rapidly since the saturation deficit in the tissues was not immediately satisfied.

Distribution of the velocities of absorption of water in the onion root, H. F. ROSENE (*Plant Physiol., 12 (1937), No. 1, pp. 1–19, figs. 5*).—A method is described for simultaneous determination of precise quantitative data on the velocities of tap water absorption by different regions of the same intact root under controlled conditions. All regions between the root cap and the bulb absorbed tap water, but at unequal rates. In relatively young roots there was a unidirectional gradient in the distribution of velocities of water absorption, maximum absorption occurring at the base. In relatively older roots there were two pronounced unidirectional gradients with maximum absorption velocities 40–60 mm from the apex. The velocities of water absorption were less in all root regions between the cap and base in any one root when all the sister roots were present. Removal of the latter increased the rates of absorption in all regions of the remaining root. Each root region went through a maximum with respect to age, having the highest velocity rates when 40–60 mm long. With increased age there was a shift of the region of maximum rates toward the apex.

A working bibliography of day-length and artificial illumination as affecting growth of seed plants, supplement, F. RAMALEY (*Colo. Univ. Studies, 24 (1937), No. 2, pp. 121–126*).—This bibliography of photoperiodism and allied topics supplements one already noted (E. S. R., 70, p. 26).

Respiration of green and chlorophyll-deficient types in maize, M. G. GRONER (*Amer. Jour. Bot., 23 (1936), No. 6, pp. 381–385, figs. 7*).—Under normal conditions respiratory rates of normal and albino corn seedlings were found practically identical. The effect of unusual treatments is discussed.

Physiological problems involved in seed dormancy, E. H. TOOLE (*Compt. Rend. Assoc. Internatl. Essais Semences (Proc. Internatl. Seed Testing Assoc.), 8 (1936), No. 1, pp. 33–41*).—This is a critical review of recent work (with bibliography of 15 titles) on the occurrence of, and methods of breaking, dormancy and on the physiological changes during dormancy, followed by a gen-

Change in activity of enzymes, soluble carbohydrates, and intensity of respiration of rice seeds germinating under water, P. S. ERYGIN (*Plant Physiol., 11 (1936), No. 4, pp. 821–832, figs. 3*).—"Germination of rice seeds under water is accompanied by greater loss of dry matter and change in properties of colloidal substances than germination on filter paper. In addition, the volume of the seedling itself increases more rapidly on the filter paper than under water. Soluble carbohydrates are found in greater quantities in the dry seeds of lowland varieties than in those of upland varieties. The main forms of soluble carbohydrates in the rice seeds are saccharose and monosaccharides. Maltose is found during certain stages of germination under water. In general, enzyme action is suppressed in seeds germinating under water especially in the case of saccharase and catalase. This begins from the time of swelling of the seed and continues through the germinating period. . . .

"The respiratory quotient for both lowland and upland varieties when germinated on filter paper is approximately the same, but differs markedly in the case of seeds germinated under water. In the latter case the respiratory quotient is always greater than unity."

The stimulation of seedling plants by organic matter, J. R. PILAND and L. G. WILLIS (*Jour. Amer. Soc. Agron., 29 (1937), No. 4, pp. 324–331, figs. 5*).—In experiments by the North Carolina Experiment Station, organic materials such as gossypol and the decomposition product of filter paper stimulated growth in mustard seedlings. Copper and manganese effects were additive to those of organic matter. Growth was inversely proportional to the percentage of iron in the tops of mustard plants, and those with filter paper treatments had, in general, less total iron than the other two series.

It is concluded that this phenomenon is associated with the oxidation-reduction equilibrium, that the results pertain to an important function of organic matter in soils and of organic ammoniates in fertilizers, and that copper and manganese promote a favorable reaction.

Blooming of potatoes as influenced by pyrethrum dust, E. O. MADER and E. C. UDEY (*Phytopathology, 27 (1937), No. 1, pp. 112, 113*).—In tests of the 1936 season increased blooming occurred on the pyrethrum-treated as compared with the control plats. The mechanism of this reaction has not yet been determined.

Cytological studies of toxicity in meristem cells of roots of Zea mays.—I, The effects of the neutral salts, J. K. EDWARDS (*Amer. Jour. Bot., 23 (1936), No. 7, pp. 483–489, figs. 13*).—The toxic effects of the chlorides of potassium, sodium, magnesium, and calcium were investigated by exposing the roots to various concentrations of the salt solutions, followed by 48 hr. in acid and basic fixatives, sectioning 8μ in thickness, and staining with iron-alum haematoxylin.

The influence of several benzene derivatives on the roots of Lupinus albus, M. CHRYSOSTOM (*Amer. Jour. Bot., 23 (1936), No. 7, pp. 461–471, figs. 15*).—As a result of tests with four phenols (phenol, cresol, resorcinol, and pyrogallol), three acids (benzoic, salicylic, and gallic), and two amines (aniline and methyl aniline), it is concluded that there is no apparent agreement between toxicity and complexity of structure in these compounds, but there was some indication of a relation of toxicity with temperature in phenol, cresol, aniline, and methyl aniline.

Bibliography of references to the literature on the minor elements and their relation to the science of plant nutrition, compiled by L. G. WILLIS (*New York: Chilean Nitrate Ed. Bur., Inc., 1936, 2. ed., pp. [5]+396*).—This edition contains about 1,000 more references and abstracts than the first

The importance of ash elements in the cultivation of excised root tips, W. J. Robbins, V. B. White, J. E. McClary, and M. Bartley (*Natl. Acad. Sci. Proc., 22 (1936), No. 11, pp. 636–639*).—At the University of Missouri, the addition of agar or "qualitative" filter paper (not ashless) to flasks containing excised corn root tips in a synthetic culture solution was found to increase average root growth over five times. The ash of qualitative filter paper or agar proved equally effective. Ashless filter paper was ineffective. The need for traces of minerals other than those supplied in culture formulas is thus felt to deserve further study.

Selenium bearing vegetation during late Cretaceous time, O. A. Beath and C. S. Gilbert (*Science, 84 (1936), No. 2187, pp. 484, 485*).—Evidence presented in this contribution by the University of Wyoming is believed to confirm the theory that many of the existing toxic areas in the Rocky Mountain regions have originated by vegetative enrichment of selenium through cycles of growth and decay of highly seleniferous native plants, such as species of *Astragalus*.

Selenium in soils and vegetation associated with rocks of Permian and Triassic age, O. A. Beath, C. S. Gilbert, and H. F. Eppson (*Amer. Jour. Bot., 24 (1937), No. 2, pp. 96–101, figs. 2*).—From analyses of rocks and plants from the southeastern part of Wyoming to the western border, made by the Wyoming Experiment Station, "it is evident that selenium is definitely a primary constituent of stratigraphically equivalent rocks of Permian and Triassic age. With the possible exception of the Woodside formation, selenium occurs in rock successions which are believed to be stratigraphical equivalents by leading authorities."

Growth of the avocado tree in solution culture, A. R. C. Haas (*Calif. Avocado Assoc. Yearbook, 1936, pp. 66–69, fig. 1*).—In this contribution from the California Citrus Experiment Station a method for growing avocado trees in various culture solutions is presented. It involves continuous aeration, since oxygen is one of the most important elements for this species. Thus far, young trees have been grown successfully by adding boron, manganese, and iron to the common salts used for culture solutions, and by having aluminum present during the period of omission of phosphate. The method is applicable to various physiological studies of the species.

Pectin in avocado leaves, A. R. C. Haas (*Calif. Avocado Assoc. Yearbook, 1936, pp. 72–74*).—In this study at the California Citrus Experiment Station analyses are presented of the total pectin content in the dry matter of healthy and tipburned avocado leaves and, for comparison, in that of healthy and mottled walnut leaves. Considerable amounts were found.

Seasonal fluctuations in growth rates of excised tomato root tips, P. R. White (*Plant Physiol., 12 (1937), No. 1, pp. 183–190, figs. 4*).—"The growth rates of a clone of isolated tomato root tips cultivated in vitro and measured at weekly intervals for a period of 3 yr. show a random fluctuation around a mean due to variations in the behavior of the individual cultures. In addition, these growth rates show a cyclic fluctuation correlated with the seasons of the year. Investigation of the effects of light v. darkness showed that seasonal fluctuations in illumination are a negligible factor in producing this cycle. Investigation proved, however, that such cultures are very sensitive to temperature differences and that the observed fluctuations in temperature are sufficient to account for the observed seasonal variations in growth rate. It will probably be necessary to control the room temperature more accurately than has been done in the past if uniform cultures are to be maintained throughout the year."

The bibliography cites 18 references.

The influence of soil moisture and fertilizers on the specific electrical conductivity of tomato plant sap, A. C. Foster and E. C. Tatman (*Amer. Jour. Bot., 24 (1937), No. 1, pp. 35–39, fig. 1*).—"A detailed study has been made of the influence of approximately controlled soil moisture and of fertilizers on the response of tomato plants with reference to growth, amounts of water used daily, water requirement or rate of transpiration, and the relation of this response to the specific electrical conductivity of the plant sap. There appears to be a highly significant relation between the fertilizer materials and water in the soil, the amount of water used daily by the plants, and the ultimate water requirement of the plants. Among cultures grown at different soil moisture contents there occurred a positive correlation between the electrical resistance of the plant sap and the soil moisture. Furthermore, sudden increase in soil moisture caused a corresponding increase in the electrical resistance in the sap taken from leaves, green fruit, and ripe fruit of an individual plant. Successively larger amounts of soil nitrates in different cultures were reflected by correspondingly higher electrolytes in the plant sap as indicated by a lower electrical resistance. Potassium sulfate appeared to have a similar influence. However, the different fertilizer treatments used did not influence the electrical resistance of the plant sap as greatly as did the soil moistures employed."

Secondary root hairs, M. E. Pinkerton (*Bot. Gaz., 98 (1936), No. 1, pp. 147–158, figs. 8*).—In the monocotyledons studied (Commelinaceae and *Philodendron cordatum*, asparagus, and corn), a so-called "persistent" hirsuteness of practically the whole root system was found to exist. The constituent cutinized hairs proved to be of cortical origin, superseding the primary epidermal hairs. It was deemed logical that this condition may be associated with the lack of secondary thickening, but the function was not determined.

Anatomical structure of stems in relation to the production of flowers, O. C. Wilton and R. H. Roberts (*Bot. Gaz., 98 (1936), No. 1, pp. 45–64, figs. 43*).—By this study at the University of Wisconsin it was found that the flowering stems of all the species examined apparently had certain anatomical characteristics in common, regardless of age or of photoperiodic classification, and they are compared with those of nonflowering stems.

The consistent differences in structure, accompanying the changes in character of growth as seen in sections from stems of plants bearing aborting floral buds and of plants producing a second set of flowers following a period of nonreproductive growth, are offered as evidence that the anatomy of the stem is related to the reproductive character of the plant. The fact that stems of disbudded plants have a structure resembling that of a flowering stem appears to indicate that the characteristic structure accompanies, but is not a result of, the production of flowers.

A critique of plant serology.—I, The nature and utilization of phytoserological procedures, K. S. Chester (*Quart. Rev. Biol., 12 (1937), No. 1, pp. 19–46*).—This critical review discusses the preparation of plant antigens and immune sera, precipitation reactions, anaphylactic reactions, lytic reactions, agglutination reactions, acquired resistance to plant pathogens and toxins, and other serological tests with plant antigens.

The proteolytic enzymes of some common molds, J. Berger, M. J. Johnson, and W. H. Peterson (*Jour. Biol. Chem., 117 (1937), No. 2, pp. 429–438, figs. 2*).—The proteolytic enzyme content of 30 common molds (mostly species of *Aspergillus* and *Penicillium*) were studied in detail in this investigation by the University of Wisconsin. The proteolytic system was found to consist of at least 1 proteinase and at least 5 peptidases, viz, a dipeptidase, a carboxypolypep-

tidase, an aminopolypeptidase, and 2 enzymes hydrolyzing diglycine and triglycine. The kinetics of amino nitrogen liberation from gelatin and of the hydrolysis of leucylglycine, leucyldiglycine, chloroacetyl-*l*-tyrosine, and triglycine by mold enzymes were studied. While the hydrolysis of gelatin and leucylglycine was a zero order reaction, that of the other peptides was of first order. The molds contained the different components in greatly varied amounts. The Aspergilli were generally higher in enzyme content than the Penicillia, but there was wide variation within the same genus. The amounts of the components varied also with the medium and the incubation time. The optimum H-ion concentration for the proteinase of 3 molds acting on gelatin proved to be about pH 7.

Relative potency of reductase in dry, wet, and germinated Lupinus albus seeds, D. I. Macht and H. F. Bryan (*Amer. Jour. Bot., 24 (1937), No. 3, pp. 133, 134*).—"Seeds soaked overnight and extracted by the method described . . . yielded the largest quantity of reducing enzymes. . . . Stems and roots are very poor in reducing substances as compared with either seeds or cotyledons."

Clostridium (Bacillus) tetrylium n. sp., a new species of the Acetobutylicum group, W. L. Owen, R. L. Mobley, and R. Arroyo (*Zentbl. Bakt. [etc.], 2. Abt., 95 (1936), No. 5–8, pp. 131–134*).—This contribution by the Louisiana and Puerto Rico College Experiment Stations describes *C.* (*Bacillus*) *tetrylium* n. sp. (including methods of isolation and cultivation), and gives the comparative physiological properties as to their industrial interest for the production of solvents.

Physiological studies with the nitrogen-fixing alga, Nostoc muscorum, F. E. Allison, S. R. Hoover, and H. J. Morris (*Bot. Gaz., 98 (1937), No. 3, pp. 433–463, figs. 9*).—This paper gives a full description of the organism and detailed results of physiological studies, from which it is concluded that this blue-green alga is of considerable importance in soils and possibly also in fresh ponds and lakes, adding both nitrogen and organic matter to its growth medium. A general discussion of the economic importance of the Myxophyceae in soils is given, and a bibliography of 35 titles is included.

Effect of chemical treatment of pea seed on nodulation by Rhizobium leguminosarum, K. J. Kadow, L. E. Allison, and H. W. Anderson (*Illinois Sta. Bul. 433 (1937), pp. 12, figs. 4*).—Nodulation of peas induced by seed inoculation with *R. leguminosarum* was practically prevented by treatment of inoculated seed with Semesan, cuprous oxide, or Vasco 4 (principally zinc oxide), but these chemicals had no noticeable effect on nodulation by bacteria present in the soil. In many cases the reduction in number of nodules by seed treatment appeared to be partially offset by increases in the size of the individual nodules, and a few cases were observed under commercial field conditions where cuprous oxide treatment of inoculated seed did not materially reduce nodulation. No explanation of the latter finding is yet at hand. In these tests the most consistently satisfactory chemical for pea seed treatment under field conditions was cuprous oxide.

It is believed that varieties not needing treatment might better be inoculated without the seed treatment, so that the bacteria may thus become established in the soil. After this, other varieties needing seed treatment may be grown. Limited data and experience indicate that graphite added to inoculated seed before chemical treatment will permit about one-fourth normal nodulation to occur without materially influencing the effect of the treatment on the stand and vigor of the seedlings.

Acid production by the Escherichia-Aerobacter group of bacteria as indicated by dissolved metallic iron, A. V. Sybocki, J. E. Fuller, and R. L. France

(*Jour. Bact.*, *33* (*1937*), *No. 2*, *pp. 185–192*, *fig. 1*).—This is a contribution from the Massachusetts Experiment Station.

Formation of sulfide by some sulfur bacteria, R. L. Starkey (*Jour. Bact.*, *33* (*1937*), *No. 5*, *pp. 545–571*).—Small amounts of sulfide were found by this study at the New Jersey Experiment Stations to be evolved by *Thiobacillus thioparus* and *T. thiooxidans* growing in fluid media. Various heterotrophic bacteria, actinomycetes, and filamentous fungi also evolved sulfide from inorganic media containing elemental sulfur, and some of the actinomycetes and fungi produced sulfide from thiosulfate in strictly mineral media.

"The hydrogenation of sulfur by the sulfur bacteria suggests the presence of active —SH groups in their cells. This reaction appears to have the same significance with the sulfur bacteria as with the heterotrophic micro-organisms.

"It is considered unlikely that elemental sulfur undergoes hydrogenation preceding its entrance into the cells of the sulfur bacteria which oxidize the sulfur to sulfate."

A three-page bibliography is included.

Viability of bacteria in sea water, S. A. Waksman and M. Hotchkiss (*Jour. Bact.*, *33* (*1937*). *No. 4*, *pp. 389–400*).—This cooperative study was made by the New Jersey Experiment Stations, the Woods Hole Oceanographic Institution, and the New York Medical College and Flower Hospital relative to the survival of an agar-liquefying marine bacterium and a number of common sea water bacteria added to fresh sea water, to sea water sterilized by heat or filtration, and to prepared salt water. Only the fresh sea water exerted a marked destructive effect. It is suggested that the activities of the animal population of the sea (especially the nannoplankton) can explain, at least partly, both the destruction of the bacteria and the stimulation of the processes of organic matter decomposition. The facts presented are used as a basis for explaining the low numbers of bacteria usually found in natural sea water.

A simple method for preserving bacterial cultures by freezing and drying, H. F. Swift (*Jour. Bact.*, *33* (*1937*), *No. 4*, *pp. 411–421*, *figs. 2*).—Bacteria maintained their original cultural, immunological, and biochemical characteristics and their virulence for many years at room temperature when completely dried in a frozen state, provided the cultures so dried were well sealed. Two methods are described for freezing and drying the material.

A method of freeing fungi from bacterial contamination, J. R. Raper (*Science*, *85* (*1937*), *No. 2205*, *p. 342*, *fig. 1*).—A glass ring is placed in a Petri dish of agar medium so that its upper edge extends above the agar. The lower edge is raised slightly above the bottom of the dish by glass rests. The fungus to be freed of bacteria is inoculated onto the surface of the agar within the ring. The hyphae grow down through the agar, under the bottom of the ring, and out into the surrounding uncontaminated agar without the bacteria following. Sterile transfers can then be made with ease.

The use of ultra-violet irradiated culture media for securing bacteria-free cultures of Saprolegnia, I. H. Blank and W. N. Tiffney (*Mycologia*, *28* (*1936*), *No. 4*, *pp. 324–329*, *fig. 1*).—"Bacteria-free cultures of *Saprolegnia* were readily obtained from badly contaminated sources by first growing the organism on an ultraviolet-irradiated medium containing levulose, peptone, and agar. . . . It is thought that this method will be applicable to the isolation of other fungi."

A note on the temperature relations of certain fungi, N. E. Stevens (*Mycologia*, *28* (*1936*), *No. 6*, *pp. 510–513*, *fig. 1*).—Using species of *Diplodia*, *Physalospora*, and *Botryosphaeria* grown on agar plates in an unusually accurate series of temperature chambers, the radial growths in 24-hr. periods were determined and are presented graphically.

Continued study of these fungi led to the conviction that the spore size and the growth rate are, in some way not yet understood, related in a significant manner, the larger spored fungi apparently being much less common and widely distributed in nature and their growth rates much slower.

GENETICS

An improved method for the study of chromosomes, E. C. Jeffrey (*Stain Technol., 12 (1937), No. 1, pp. 9–12*).—Using the chromosome fixation method described, excellent results were obtained by cutting up the material in very thin slices of almost microscopical tenuity and passing them immediately into fixing solutions containing osmic acid. The material was then assembled on cards, and, after embedding in nitrocellulose, sectioned to 5μ or even thinner. Practically all methods of staining may be used, but best results were obtained with Heidenhain's hematoxylin bleached almost to disappearance and followed by prolonged treatment with aqueous safranin. The differentiation of the chromosomes thus obtained indicates that they consist of a ground substance in which are situated two chromatids. In somatic tissues these chromatids generally appear to be spirals running in opposite directions. The crossing points of these spirals are responsible for the optical illusion which has been designated the "gene."

Symbols for genes [trans. title], H. Nachtsheim, R. Schick, and O. von Verschuer (*Ztschr. Induktive Abstam. u. Vererbungslehre, 73 (1937), No. 1, pp. 55–62*).—Suggestions are given for a nomenclature which might be internationally adopted for genes.

Studies on the genetics of smuts of barley and oats in relation to pathogenicity, C. C. Allison (*Minnesota Sta. Tech. Bul. 119 (1937), pp. 34, figs. 9*).—In Minnesota loose smut (*Ustilago nuda*) is more prevalent than covered smut (*U. hordei*), probably due largely to relative differences in the susceptibility of the barley varieties commonly grown and to differences in the effectiveness of seed treatments for the two smuts.

For study of the pathogenicity and genetics of *U. hordei* and *U. medians*, the partial vacuum method of barley seed inoculation with chlamydospores gave much better infection than the dusting method and also proved most satisfactory for inoculating barley or oat seeds with monosporidial combinations. Collections of *U. hordei* were found to differ from one another in virulence for 11 barley varieties, and 27 of 28 collections could be differentiated on 6 of these varieties. On the basis of type of smutted plant produced, 3 collections could be further differentiated on Minnesota No. 474 grown in the greenhouse.

Factors for sex in *U. hordei* and *U. medians* segregated in a 2:2 ratio, and factors for cultural characters in *U. hordei* segregated in ratios of 3:1, 2:2, and 0:4, and independently of the factors for sex. Variants differing culturally from the parent colonies were observed. *U. hordei* hybridized readily with *U. medians*, as shown by sporidial fusions and production of viable chlamydospores. Chlamydospores in F_1 were echinulate, and the smutted head type was intermediate. The F_2 segregated for chlamydospore wall character and for head type, although there appeared to be no linkage. Combinations of head type and chlamydospore wall markings differing from either parent type occurred in F_2. Segregation for pathogenicity occurred in F_2 dicaryophytes, and some of the latter were more pathogenic for certain varieties than the parent dicaryophytes. *U. hordei* and *U. medians* hybridized with *U. avenae*, *U. levis*, and *U. tritici* as far as fusions and initiation of the dicaryophase, but

seed inoculations with these combinations failed to produce smutted heads and no smut hyphae were found in the young seedlings. The meager data on hybridization of *U. hordei* and *U. medians* × *U. nuda* were negative for production of smut mycelia or chlamydospores in the hosts. The nuclear condition of the sporidial fusions apparently differed but little in intra- and interspecific crosses. The dicaryophase was initiated soon after fusion when the two nuclei of a fusion pair became associated in the same sporidium.

When the chlamydospores of *U. hordei* germinated beneath the seed hull they typically produced a promycelium, the cells of which readily fused instead of producing sporidia. The nuclear condition of these fused promycelial cells was evidently similar to that of fused sporidia. The *U. hordei* mycelium was predominantly dicaryotic in the host, but many hyphae with one or more than two nuclei per cell were observed.

***Genetical studies on mutants in the progeny of heat-treated barley*, F. H. Peto** (*Canad. Jour. Res., 15 (1937), No. 5, Sect. C, pp. 217–229, pl. 1*).—After heat treatments were applied to barley seeds, different mutant characters observed in the progeny included $xantha_{1,2}$, $dwarf_{1,2,3,4}$, $virescent_{1,2}$, chlorina, and albino. While typical Mendelian ratios were not obtained in the first segregating generation, owing to the small size of the sector affected in the generation of treatment, in the second and third segregating generations good fits were obtained in all cases to either monohybrid or dihybrid ratios. Both 3:1 and 15:1 ratios were observed in lines segregating for $xantha_1$ and albino characters, requiring the postulation of the duplicate factor hypothesis to explain this situation. Chlorina and dwarf mutants segregated in all the cases investigated as simple Mendelian recessives. One virescent strain, believed to have arisen through plastid mutation, was maternally inherited. The heat treatment increased significantly the natural mutation rate for the xantha characters, but apparently had no effect on the albino mutation rate. Dwarf, virescent, and chlorina mutants were observed in the segregating generation after heat treatment, but were not detected in untreated populations.

Inheritance in barley, II, D. W. Robertson (*Genetics, 22 (1937), No. 4, pp. 445–451*).—The second in this series (E. S. R., 69, p. 344) reports tests of three chlorophyll-deficient seedling factor pairs with known factor pairs located in the seven different linkage groups in barley.

A factor pair $A_{c3}a_{c3}$ for green v. white seedlings in Coast II was found linked with *Nn* (covered v. naked seeds) in group III, with 27.24±2.04 percent crossing-over. $A_{c3}a_{c3}$ was inherited independently of factor pairs located in five of the other linkage groups. X_sx_s (green v. yellow seedlings) in Smyrna I (citron green of Ridgway) was found linked with factor pairs found in group VI. A_na_n (green v. white seedlings) found in *Hordeum distichon nigrinudum* I was found linked with X_sx_s and a factor pair in group VI. The linkage relations with percentages of crossing-over were A_ca_c and X_cx_c linked with less than 4 percent of crossing-over (E. S. R., 60, p. 726), X_sx_s with A_ca_c with 25.74±1.73 percent, A_na_n with X_cx_c with 9.37±0.65 percent, and X_sx_s linked with A_na_n with 15.49±0.86 percent. The linear arrangement evidently is A_ca_c, X_cx_c, A_na_n, and X_sx_s. Indications were that A_na_n and X_sx_s are inherited independently of factor pairs located in the other linkage groups.

Failure of diakinesis and metaphase pairing and the behavior during meiosis of univalent chromosomes in Zea mays, LeR. Powers and A. O. Dahl (*Jour. Agr. Res. [U. S.], 54 (1937), No. 9, pp. 655–668, pls. 4*).—In a cytological study at the Minnesota Experiment Station involving progeny of inbred lines of corn, H93 and H94, the variance of data taken on the

proportion of bivalents to univalents for diakinesis was 3.6 times that of the binomial distribution. For meiocytes possessing only two univalents, the distribution of chromosomes during anaphase I was entirely random for univalent chromosomes, and hence the probability of the members of any one set of univalent and homologous chromosomes going to opposite poles was 0.5. A positive association was found between degree of failure of pairing during diakinesis and metaphase I (apparently affected by the environment) and chromatin loss.

The behavior of the extra univalent chromosome during meiosis differed from the normal complement in that it always preceded the members of the bivalent complements to the poles and was not lost in either division I or II. It was evident that this extra chromosome is not composed completely of inert material, but carries at least one gene.

The crossing plot for increasing inbred corn seed, W. R. SINGLETON (*Jour. Amer. Soc. Agron., 29 (1937), No. 1, pp. 81–83*).—Practical suggestions derived from genetic work with corn at the Connecticut [New Haven] Experiment Station are reported.

On the occurrence of "crinkled dwarf" in Gossypium hirsutum L., J. B. HUTCHINSON and R. L. M. GHOSE (*Jour. Genet., 34 (1937), No. 3, pp. 437–446, pls. 2*).—A crinkled dwarf in Indore 1 cotton (*G. hirsutum*) arose as a mutant at the same locus as crinkled dwarf in *G. barbadense*, and behaved as a complete recessive in crosses with normal strains of Upland. In an F_2 of a cross between Indore crinkled and the Egyptian wrinkled leaf (identical with Sea Island crinkled dwarf), all grades between fully normal and extreme crinkled were obtained, an exactly parallel behavior to that found by Harland (E. S. R., 74, p. 181) in crosses between Sea Island crinkled and crinkled transferred to the Upland genotype. The bearing of the data on Fisher's theory of the origin of dominance by selection among heterozygotes is discussed.

A cytological study of the genus Poa L., J. M. ARMSTRONG (*Canad. Jour. Res., 15 (1937), No. 6, Sect. C, pp. 281–297, figs. 31*).—In determinations of the somatic chromosome numbers of 20 species of *Poa*, made at the Dominion Experimental Farms, Ottawa, the basic chromosome number for the genus was found to be 7. The species arranged themselves in a polyploid series from diploid to dodecaploid, tetraploids and hexaploids being the most numerous. Three aneuploid species possessed chromosome numbers suggestive of a nonaploid origin. Polymorphism was found in *P. compressa*, *P. palustris*, and *P. nemoralis*. All species examined conformed to the long chromosome type common to the subfamily Pooideae. The spindle fiber attachment for the chromosomes in the various species ideograms was found to be regularly median or submedian.

The chromosome variability and mode of seed production were examined in *P. pratensis*, using selected, uniform strains, indigenous plants, and plants from commercial seed. The somatic chromosome number was found to range from 50 to 87±1, 10 of 19 plants examined possessing aneuploid numbers. The selected strains possessed the same chromosome number for both plants examined, while in the other material the number varied. A study of meiosis in the pollen mother cell showed the selected strains to vary from regular behavior to an irregularity of 3.9 unpaired univalents per cell. All strains had large percentages of morphologically good pollen which germinated actively on the stigmas. Reduction was observed in the egg mother cell of the selected strains, and a study of the course of embryological development showed no irregularities which might lead to aposporous reproduction. A high frequency of polyembryony observed was correlated to the degree of irregularity at

meiosis. A theory is advanced to explain how constant aneuploid numbers may be maintained in sexually reproduced strains.

Cytological and embryological investigation of potatoes in connection with their sterility, R. A. Beĭlis (Bayliss) (*Zhur. Inst. Bot. Ukrain. Akad. Nauk (Jour. Inst. Bot. Acad. Sci. Ukraine, 10 (1936), No. 18, pp. 99–143, figs. 75; Eng. abs., pp. 128–130)*.—From a detailed study involving 17 potato varieties (1933–34), it is concluded that the basic cause of sterility evidently lies in abnormalities of meiosis in the pollen mother cells, which arise from the unbalancing of the chromosomes—possibly because of the hybrid origin of the potato. In different varieties this unbalancing is manifested unequally, which appears to condition the different degrees of fertility in individual varieties. Environal conditions are also considered important factors in sterility, but the observation of the same abnormalities in male gametophyte development by investigators in different continents and latitudes and under different climatic conditions suggests that the basic cause lies in internal rather than in external conditions.

Methods of strawberry breeding in Louisiana, J. C. Miller (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 339, 340*).—Assembling varieties known to possess some degree of resistence to leaf spot (*Mycosphaerella fragariae*) and scorch (*Diplocarpon earliana*), crosses were made at the Louisiana Experiment Station in an attempt to develop new strawberries sweeter than Klondike but retaining the firmness and other desirable characters of that variety. Crosses were made in April or May, seeds held in cold storage until the next February when sown in flats, the plants were set out of doors on about June 1, and the seedlings were sprayed repeatedly with spore suspensions of the above two organisms. On a basis of disease resistance and of desirable quality, only about 2–5 percent of the seedlings were saved for the second year's observations.

Breeding hardy grapes, A. F. Yeager (*Amer. Soc. Hort. Proc., 33 (1936), pp. 414, 415*).—Stating that *Vitis vulpina* withstands North Dakota winters without injury, the author reports on breeding work at the North Dakota Experiment Station in which an F_2 generation was produced from *V. vulpina* × Concord and *V. vulpina* × Eclipse. Of the 139 seedlings which survived the cold winter of 1935–36, 67 fruited in 1936, bearing white or purple fruit ranging in size from *V. vulpina* to Eclipse and in flavor from very acid to sweet. Failures to obtain segregates in selfing Beta and Alpha varieties are believed to indicate that these are not hybrids but probably simply *V. vulpina* or some botanical variety thereof.

Hybridization studies on a zinc-induced variant of Hypomyces ipomoeae, A. W. Dimock (*Mycologia, 29 (1937), No. 3, pp. 273–285, figs. 2*).—A striking variant was produced in experiments by the University of California through cultivation of monoploid hyphae of *H. ipomoeae* on a medium containing a sublethal dosage of zinc nitrate, but the genic alteration or mutation cannot be considered a specific effect of the zinc ion without further evidence.

The effect of phosphorus on chromosome and nuclear volume in a violet species, W. P. Pierce (*Bul. Torrey Bot. Club, 64 (1937), No. 6, pp. 345–355, pl. 1, figs. 2*).—The results of this study by the Vermont Experiment Station indicated an increase in chomosome volume induced by an excess of phosphorus. The relations of the findings to plant size and vigor are discussed.

Progeny tests of dairy sires, G. Bonnier (*Hereditas, 22 (1936), No. 1–2, pp. 145–166*).—A comparison of several bull indices showed that the index of least variance is the best for recalculating the data for each year, but for prediction purposes an index based on dam-daughter comparisons seemed most serviceable.

Impacted molars: A new lethal in cattle, E. E. Heizer and M. C. Hervey (*Jour. Heredity, 28 (1937), No. 3, pp. 123–128, figs. 4*).—A condition of impacted

molars resulting in a parrot-mouthed appearance was found in eight calves born in an inbred Milking Shorthorn herd. The abnormal calves died during the first week. Pedigrees of five calves which could be traced indicated that the condition was due to the action of a single pair of recessive genes. The occurrence of lethal factors in cattle is reviewed.

Albinism in a cocker spaniel, J. McI. Phillips (*Jour. Heredity, 28 (1937), No. 3, pp. 103, 104, fig. 1*).—The production of a pure white male in a litter with five red and white males by red and white cocker spaniel parents is noted. The puppy had blue eyes without deformity. There were a few light brown flecks in the skin of the nose, lips, and footpads.

A "cat-dog" from North Carolina: Hairless gene or "maternal impression"? H. Sternberger (*Jour. Heredity, 28 (1937), No. 3, pp. 115, 116, fig. 1*).—The occurrence of a hairless kitten with a short tail and some dog-like habits in a litter with four kittens, two others of which also had short tails, is noted.

The antiquity of mouse variations in the Orient, C. E. Keeler and S. Fuji (*Jour. Heredity, 28 (1937), No. 3, pp. 93–96, figs. 3*).—Oriental art objects from the eighteenth century depict characteristics of albino, pink-eyed dilute, chocolate, black-eyed white, recessive piebald, black, white face, and possibly waltzing mice.

The inheritance and expression of fused, a new mutation in the house mouse, S. C. Reed (*Genetics, 22 (1937), No. 1, pp. 1–13*).—An account is given of the genetics of a character in the house mouse designated as "fused", which varies in its expression from asymmetrical fusion of vertebrae, the lack of all or part of the tail, or fusion of ribs at the proximal ends to normal. The fused gene is dominant to the normal except for normal overlaps in both homozygous and heterozygous animals and is linked with brachyury. Selection for modifying factors by breeding with strongly fused in one line and weakly fused animals in another was ineffective. In reciprocal backcrosses of F_1s (fused) to normals significantly different percentages of normal and fused progeny were obtained, suggesting the operation of extrachromosomal influences on the expression of the fused gene or the action of modifying factors contributed by certain strains. Evidently the *Mus bactrianus* species carried modifying factors preventing the expression of fused. In crossing fused mice with this species, the F_1 and backcross to normal progeny were normal. Bifurcated tails were frequently observed in fused animals, but the variation in the fused condition did not seem to be hereditary. Tests were made of the linkage relations between the fused gene and the 12 linkage groups with negative results. However, there was such a close linkage (less than 10 percent crossing over) between fused and brachyury that an allelic relationship was suggested.

Studies on spotting patterns, I–III (*Genetics, 22 (1937), Nos. 1, pp. 14–64, figs. 4; 2, pp. 307–318*).—Three papers are reported.

I. *Analysis of quantitative variations in the pied spotting of the house mouse,* L. C. Dunn and D. R. Charles (pp. 14–42).—Quantitative determination was made of the percentage of white and black on the dorsal and ventral surfaces of pied *ss* mice. Through inbreeding and selection in *ss* individuals, belted, white-faced, and all-white lines were produced which showed much less variability as regards the amount of white exhibited by any one line. Specific strains breeding relatively true were also developed within these lines for such characters as width of belt and location of spots. The variations which existed after more than 20 generations of inbreeding were considered to be mainly nongenetic, since about the same type of progeny was produced by the parents exhibiting the variations. Further it was impossible to fix these variations. In crosses between the purified strains, the F_1s and F_2s were

intermediate between the parents with greater variation in the F_2s. By crossing spotted strains together, the results indicated the operation of a gene complex designated as *K* and consisting of at least three genes modifying the dominance of *S* over *s* and the relative amounts of spotting produced. In the absence of the spotting gene the factors in the modifier complex may themselves cause spotting.

II. *Genetic analysis of variegated spotting in the house mouse*, L. C. Dunn (pp. 43–64).—In making a genetic analysis of the variations in pattern of variegated mice and the interaction with the other spotting genes, it was found that variegated mice produced several kinds of progeny in addition to variegated, i. e., anemic young which died soon after birth, self-colored, black-eyed white, and pied offspring. All were nonagouti black *aaBB* and heterozygous for *W* in combination with *S* or *s*. There was much variation from the black-eyed whites to those with only a few white hairs. Fourteen generations of selection for increased amounts of white spotting in *WwSS* variegated mice showed the effects of a combination of at least three modifying factors for white spotting acting mainly on *W*. The *WwSS* individuals were 90 to 98 percent white, and the *wwSS* individuals showed a maximum of 5 percent white as a result of the combined action of these modifiers designated as *m*(*W*). The anemics (*WW*) were black-eyed white. Quantitative variations in the amounts of black and white in the variegated pattern were due to these modifiers and nongenetic causes. These studies showed that *W* acts as a dominant when the complex of modifiers is present and as a recessive in the presence of the alleles of these modifying factors, regardless of the spotting genes. With intermediate numbers of the modifying genes, *W* is incompletely dominant.

III. *Interaction between genes affecting white spotting and those affecting color in the house mouse*, L. C. Dunn, E. C. MacDowell, and G. A. Lebedeff (pp. 307–318).—Continuing this series, measurement was made of the white areas on the yellow pied and black pied progeny produced by crossing yellow pied ($A^y ass$) and black pied ($aass$) mice. The measurements showed the yellow pied individuals to be 61.85±0.74 percent white and the black pied 72.05±0.65 percent white. Likewise, the yellow progeny from crossing yellow black-eyed-whites ($A^y aWwss$) with black pieds showed the presence of smaller areas of white than their black litter mates. To be assured that this reaction was between the genes for yellow and white spotting and not due to modifiers of *W*, the *m*(*W*) genes, the amount of white was determined on the yellows and blacks produced by backcrossing yellow hybrids from a yellow self ($A^y AwwSS$) × a black light variegated line ($aaWwSS$)+m(W) to the black variegated line. The amount of spotting on the yellows was again less than that on the blacks. Since the amount of spotting in the variegated pattern is determined by specific modifiers of *W*, the yellow gene must interfere with the action of *m*(*W*). Further results showed that the yellow gene had no important effect on spotting due to the *s* and *k* genes.

The transmission of breast and lung cancer in mice, J. J. Bittner and C. C. Little (*Jour. Heredity, 28 (1937), No. 3, pp. 117–121*).—The incidence of mammary carcinoma in reciprocal crosses between high and low tumor lines showed such wide differences in accord with the incidence in the strain from which the mother was derived that extrachromosomal forces were postulated. The breast cancer-producing influence was apparently transmitted through the milk of the high breast cancer stock females. Modifications in the incidence were brought about by fostering young on mothers from other stocks. Lung tumor incidence seems due to the action of one or more dominant factors with nonsignificant differences in reciprocal crosses.

Investigations on silver and red foxes based on the phenotypic characteristics of the pelt [trans. title], C. HOLECEK-HOLLESCHOWITZ (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 37 (1937), No. 1, pp. 37–76, figs. 32*).—Study was made of the phenotypic variations in the hair and colors of 500 fox pelts.

Genetics of the fowl.—VI, A tentative chromosome map, F. B. HUTT (In *Neue Forschungen in Tierzucht und Abstammungslehre* [*Duerst Festschrift*]. *Bern: Verbandsdruckerei AG., 1936, pp. 105–112, fig. 1*).—Continuing this series (E. S. R., 76, p. 319), the location of genes for head spot, inhibitor of dermal melanin, barring, brown iris, light down, silver and slow feathering in the sex chromosome; crest, dominant white and frizzling; creeper, rose comb and uropygial; silkie and flightless; and pea comb, marbling in down, and naked neck in other groups are postulated with a presentation of a map for these five chromosomes in the fowl.

Developmental analysis in plumage.—I, The individual feather: Methods, M. JUHN and R. M. FRAPS; **II, Plumage configurations and the mechanism of feather development,** R. M. FRAPS and M. JUHN; **III, Field functions in the breast tracts,** R. M. FRAPS and M. JUHN (*Physiol. Zool., 9 (1936), No. 3, pp. 293–318, pls. 2, figs. 6; pp. 319–377, pls. 5, figs. 19; pp. 378–406, pl. 1, figs. 8*).—These papers deal with the development of the individual feather, involving measurements of pattern components in the definitive mechanism of feather growth, accounting for certain patterns and the asymmetry and gradient relations of the breast tracts.

The inheritance of shank color in chickens, P. D. STURKIE, C. B. GODBEY, and R. M. SHERWOOD (*Poultry Sci., 16 (1937), No. 3, pp. 183–188*).—In studies at the Texas Experiment Station, crosses were made of White Leghorn, White Orpington, and Brown Leghorn hens with Black Langshan roosters to determine the inheritance of color. In explaining the results it is suggested that the sex-linked gene *D* for shank color produces predominantly light shanks and is independent of the inhibitor *I*, color *C*, and extension *E* genes. The action of the *D* gene is delayed until about 2 mo. of age. In combination with the gene for extension of melanic pigment, *d* birds may vary in shank color with variability in heterozygous (*Ee*) individuals from black to blue. In combination of recessive *e* and dominant *D*, the shanks are perfectly white or yellow. The action of the extension factor on the shanks and down of chicks is inhibited by the gene I. The barring gene *B* almost completely inhibits melanic shank color.

The inheritance of egg production in the domestic fowl, I–IV (*Sci. Agr., 16 (1936), No. 11, pp. 591–607, figs. 4, Fr. abs., p. 607; 17 (1937), No. 6, pp. 376–400, figs. 2, Fr. abs., pp. 385, 392, 400*).—Four papers are given.

I. *General considerations*, S. S. Munro (pp. 591–607).—General considerations regarding the inheritance of egg production and the influence of gene-gene and gene-environment interactions with methods of measuring the variability in Mendelian populations are presented. The necessary effort involved in phenotypic selection is not considered warranted by the results that may be expected.

II. *Increases in production, their extent and characteristics, with a discussion of causal factors*, S. S. Munro (pp. 376–385).—A statistical analysis of the production records of Barred Plymouth Rocks from 1920 to 1935 showed that the mean increased in succeeding years but the standard deviation was practically unchanged, although there was some skewness in the distribution of the production in later years. The increases in production which have occurred are considered to be due, in the main, to nongenetic causes.

III. *Differences in transmitting ability of dams, and the degree of dam-daughter correlation*, S. S. Munro, S. Bird, and J. W. Hopkins (pp. 386–392).—An analysis of the variance in the egg production of 1,165 Barred Plymouth Rock pullets from seven Dominion experimental farms when grouped by sire and dam showed that there were considerable differences in the production of daughters from the same sire from different dams. As the significance could not be shown in the smaller groups, it is considered that the genetic differences played a relatively small part in determining the total variations. The correlation between the production of all dams and daughters of 0.152, although statistically significant, was so small as to be of little practical importance in the selection of dams on the basis of their production.

IV. *Reliability of progeny tests of sires*, J. W. Hopkins, S. S. Munro, and S. Bird (pp. 393–400).—The egg records of the Barred Plymouth Rock pullets in the above studies were analyzed to determine the variance in the production of full and half sisters and the proportion of the variance which was due to environmental conditions, locality, and season. The numbers of eggs that must be laid by different numbers of dams and daughters in excess of a set standard for a 5-percent level of significance under the same and different environmental conditions are tabulated.

Investigation of the inheritance of blood group antigens in fowls, II [trans. title], O. Thomsen (*Hereditas, 22 (1936), No. 1-2, pp. 129–144*).—Further study of this problem (E. S. R., 72, p. 603) is reported, based on intermixtures of blood from the parents and the progeny with data on the agglutinations.

A technic for the sectioning of mammalian ova and blastocysts, W. W. Green, C. Barrett, and L. M. Winters (*Stain Technol., 12 (1937), No. 2, pp. 43–47, fig. 1*).—Descriptions are given for fixing, sectioning and staining mammalian ova and blastocysts.

[Modification of mammalian sexual cycles.—IV,] Relations of hair cycles in ferrets to changes in the anterior hypophysis and to light cycles, T. H. Bissonnette (*Anat. Rec., 63 (1935), No. 2, pp. 159–168*).—This continuation of the series (E. S. R., 74, p. 327) demonstrates the relationship between the hypophysis, sexual cycles, and hair cycles and light in the ferret.

Modification of mammalian sexual cycles.—V, The avenue of reception of sexually stimulating light, T. H. Bissonnette (*Jour. Compar. Psychol., 22 (1936), No. 1, pp. 93–103*).—Continuing the series above noted, the eyes are indicated as the receptors for photoperiodic stimulation in ferrets through investigations in which the animals were hooded, with and without eyeholes. Oestrus was significantly delayed in animals completely hooded and not in others.

Modification of mammalian sexual cycles.—VI, Litters from ferrets in January induced by increased exposures to light after nightfall, T. H. Bissonnette and E. E. Bailey (*Amer. Nat., 70 (1936), No. 730, pp. 454–458*).—In continuation of the series noted above, it is suggested that frequent copulation within a few hours may cause luteinization of ovarian follicles without ovulation in the ferret. Consequently, only one mating was permitted in these tests. A male and three females were brought into sexual activity by graduated exposure to electric light after nightfall. Two females became pregnant and one had a litter, although the young were unable to survive.

Modification of mammalian sexual cycles.—VII, Fertile matings of raccoons in December instead of February induced by increasing daily periods of light, T. H. Bissonnette and A. G. Csech (*Roy. Soc. [London] Proc., Ser. B, 122 (1937), No. 827, pp. 246–254*).—Continuing the above series, three pens of one

male and two female raccoons each at the Shade Swamp Sanctuary, Farmington, Conn., were lighted at night from October 10 through the rest of the season for intervals ranging from 1 to 8 hr. These animals mated in December, as contrasted with the controls, which first mated in February. Three of the females artificially lighted successfully reared young in spite of the subzero weather. Two of the three females in the lighted pens mated again in May but did not produce second litters.

The artificial induction of oestrus in the goat during anoestrus, T. S. Sutton and W. R. Krill (*Ohio Sta. Bul. 579 (1937), p. 81*).—Oestrus was induced in goats during the anoestrous period by the administration of gonadotropic substance from anterior pituitary extracts. The gonadotropic substances of human pregnancy urine and the anterior pituitary evidently differ.

Biological investigations of the spermatozoa of bulls, W. Bretschneider (*Biologische Untersuchungen an den Samenzellen des Bullen. Inaug. Diss., Univ. Leipzig, 1936, pp. 44*).—Results are reported on the duration of motility of spermatozoa of bulls as influenced by testicular extracts and other substances.

Hypophysectomy and replacement therapy in relation to the growth and secretory activity of the mammary gland, E. T. Gomez and C. W. Turner (*Missouri Sta. Res. Bul. 259 (1937), pp. 72, figs. 17*).—Results of numerous experiments dealing with the influence of hypophyseal secretions on mammary gland activity in laboratory animals showed, in general, that the administration of ovarian hormones, estrogen, and progestin, with dessicated whole sheep pituitaries, alone and in combination, failed to stimulate growth of the duct system of the mammary gland of hypophysectomized laboratory animals. Daily implants for from 20 to 25 days of rat pituitaries from donors previously injected with estrogen daily for from 10 to 20 days stimulated proliferation of the lobule-alveolar system of the mammary glands of normal and castrated hypophysectomized male and female guinea pigs, indicating that growth of the mammary gland is under the direct influence of one or more specific hormones of the pituitary produced only after stimulation by the ovarian hormones.

Hypophysectomy during lactation resulted in the cessation of milk secretion. The simultaneous injection of galactin, glucose solution, and the adrenotropic hormone or adrenal extract was capable of initiating or stimulating lactation in hypophysectomized guinea pigs and rabbits.

The pituitary glands of ewes in various phases of reproduction, V. Warbritton and F. F. McKenzie (*Missouri Sta. Res. Bul. 257 (1937), pp. 59, figs. 28*).—Cytological study was made of the pituitaries from 60 ewes slaughtered in different phases of the reproductive cycle. Four portions of the pituitary, glandular, neural, intermediate, and tuberal, and nine different cell types were identified. It was suggested that both granular and nongranular cell types were instrumental in the production of a follicle-stimulating substance and possibly of a lactogenic substance. Granular cells were thought to produce a luteinizing and possibly a mammotropic substance required for the growth of the mammary gland during the last half of the gestation period. A scheme is suggested to account for most of the observed phenomena of reproduction and the pituitary changes accompanying them.

The type and degree of gonadal stimulation induced in hypophysectomized male rats parabiotically joined with castrated, cryptorchid, and normal partners, Eugene Cutuly, D. R. McCullagh, and Elizabeth Cutuly (*Endocrinology, 21 (1937), No. 2, pp. 241–248, figs. 16*).—Greater stimulation of the testes occurred in hypophysectomized male rats joined in parabiotic union

with castrates than when the union was with normal or cryptorchid partners, suggesting a greater production or liberation of gonad-stimulating hormone from the hypophysis of castrated than from the normal animals. Both the germinal and interstitial tissues were equally stimulated, tending to support the hypothesis that only one rather than two gonadotropic hormones from the hypophysis is required to stimulate normal functioning of the testes.

The interrelationship of the pituitary sex hormones in ovulation, corpus luteum formation, and corpus luteum secretion in the hypophysectomized rabbit, M. A. Foster, R. C. Foster, and F. L. Hisaw (*Endocrinology, 21 (1937), No. 2, pp. 249–259, figs. 15*).—Hypophysectomy of female nonpregnant rabbits resulted in diuresis and blanching of the vulva on the first day, followed by atresia of the large follicles. The administration of 2 to 3 rat units daily of folliclestimulating hormones begun 2 or 3 days after hypophysectomy prevented the follicular atresia and atrophy of the uterus which usually follows hypophysectomy. If the follicle-stimulating hormone was delayed until later, and if antra-containing follicles were still present, there was an increased oestrin output with constant oestrus production. In the hypophysectomized rabbit, ovulation could be induced by administering follicle-stimulating hormone from the horse or hog pituitary for 5 days to stimulate follicular growth and following this in 8 to 10 hr. by an intravenous injection of a mixture of 50 parts follicle-stimulating to 1 part luteinizing hormones. Ovulation followed in 18 to 24 hr., but could not be induced a second time in the same animal or later than 23 days after hypophysectomy. Functional corpora lutea developed after ovulation only in cases where additional lutein hormone was administered.

Some responses of the immature female fowl to injections of mare gonadotropic hormone and oestrin, V. S. Asmundson, C. A. Gunn, and A. A. Klose (*Poultry Sci., 16 (1937), No. 3, pp. 194–206, figs. 11*).—In studies at the California Experiment Station, the response of crossbred Rhode Island Red, Barred Plymouth Rock, and White Leghorn chickens to injections of pregnant mare serum and oestrin prepared from pregnant mare urine is described. The periods of injection ranged from 5 to 42 days. The general effects on external appearance, weight, and size of the ovaries and oviducts showed that the combs of the Leghorns responded more quickly than the combs of the crossbreds. The ovaries of young crossbred chicks were enlarged from injections of pregnant mare serum through an increase in the interstitial tissue without apparent effect on the follicles. The ovaries of the older birds were similarly enlarged but were also hyperemic, although less response was noted than in younger birds. Changes in the oviducts, bursa, and long bones are described and assumed to be caused by the secretory activity of the ovary.

On the synthesis of the female ovarian hormone "Folliculosterone", I. A. Remezov (Remesov) (*Biokhimiia, 2 (1937), No. 2, pp. 344–366, figs. 7; Eng. abs., pp. 364–366*).—A product having the chemical formula $C_{18}H_{22}O_2$ which has high activity as a follicular hormone was obtained from ergosterol. The chemical nature of the product is discussed with reference to the production of other related hormones synthetically.

A note on the presence in human pregnancy urine of an acid-hydrolysable combined form of pregnandiol, A. D. Odell and G. F. Marrian (*Biochem. Jour., 30 (1936), No. 9, pp. 1533–1535*).—The presence of pregnandiol, a substance which can easily be converted into progesterone, was detected in human pregnancy urine.

FIELD CROPS

[Agronomic work in Connecticut] (*Connecticut [New Haven] Sta. Bul. 393 (1937), pp. 199, 200–203, 204–206*).—Brief reports are again (E. S. R., 75, p. 330) made on fertilizer tests with sweetpotatoes and potatoes (in cooperation with the [Connecticut] Storrs Station), and from research at the Tobacco Substation (E. S. R., 77, p. 330) concerned with irrigation of tobacco, soybean meal as a fertilizer for tobacco, effect of shade cloth on atmospheric conditions, harvesting tobacco at different stages of maturity, value of cotton hull ashes in the fertilizer formula, the effect of the element calcium, the optimum quantity of nitrogen to apply in fertilizing an acre of tobacco, and yield and quality as affected by fractional application of nitrogen.

Crops and soils information, H. B. Brown, J. R. Cotton, D. C. Neal, H. Stoneberg, J. P. Gray, D. M. Johns, F. L. Davis, and H. C. Lovett (*Louisiana Sta. Bul. 283 (1937), pp. 47, figs. 5*).—Experiments with crops and soils, conducted for various periods from 1926–36, inclusive, for which practical results are summarized included breeding work, variety, seed treatment, planting, spacing, cultivation, and subsoiling tests; X-ray, boll weevil control, oil content of seed, root and fiber studies, and fertilizer experiments including placement, sources of nitrogen and phosphorus, and rates of applying nitrogen and potassium and formulas, all with cotton; variety, breeding, planting, fertilizer, and interplanting of soybean tests, all with corn; variety, planting, grazing, and inoculation tests with soybeans; variety tests with oats, lespedeza, peanuts, sorgo, grain sorghum, crotalaria, miscellaneous grasses, legume winter cover, and green manure crops; a fertilizer test with alfalfa; variety-planting tests with rice on dry land; crop rotations; residual effect of legume green manures and date of turning under soybeans for corn; and production tests with ramie, hemp, flax, sugar beets, cowpeas, *Lespedeza sericea*, and sunflowers.

[Field crops work in Nebraska] (*Nebraska Sta. Rpt. [1936], pp. 8, 9, 11–16, 20, 21, 40, 42–44, 45, 46*).—Activities (E. S. R., 75, p. 194) reported on from the station and substations included, in addition to work already noted, variety tests with winter and spring wheat, corn, oats, barley, grain sorghums, sorgo, alfalfa, soybeans, and Jerusalem-artichokes; breeding work with corn, wheat, alfalfa, and sweetclover; crop rotations; trials of manure at different rates for sugar beets; controlled freezing studies with winter wheat; potato storage; management of permanent pastures and native meadows; and weed control, including study of the nature of herbicidal toxicity. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

[Crop production in Nebraska] (*Nebr. State Bd. Agr. Ann. Rpt., 1936, pp. 167–213, 224–256, 258–262, figs. 15*).—Papers dealing with agronomic problems, presented at the 1936 meeting of the Nebraska Crop Growers' Association, included An Agricultural Adjustment Program Based on Proper Use of Land, by O. V. Wells (pp. 167–173), and Plans for the Wider Use of Native and Introduced Grasses for Soil Conservation in Nebraska, by J. Fults (pp. 235–240) (both U. S. D. A.); Prospects for Greater Industrial Utilization of Farm Products, by L. M. Christensen (pp. 173–182) with discussion by T. A. Kiesselbach (p. 183) (Nebr.); Catch Crops and Special Crops for the State, by F. D. Keim (pp. 183–185), Some Successful Pasture Practices I Have Observed, by A. Peterson (pp. 224–229), Summary of the 1935 Nebraska Annual Pasture Contest, by A. Peterson and P. H. Stewart (pp. 230–235), Reserve Roughage When Pastures Fail, by R. R. Thalman (pp. 244–247), How Corn Varieties and Hybrids Yielded the Past Season, by T. A. Kiesselbach (pp. 248–253), Producing Hybrid Seed Corn on Nebraska Farms, by A. K. Gramlich

(pp. 253–256), and Plans, Policies, and Foundation Seed Distribution for Hybrid Seed Corn Production on Nebraska Farms in 1936, by P. H. Stewart (pp. 258–262) (all Nebr.); A Practical Program for Soil Conservation, by M. F. Miller (pp. 185–194) (Mo.); Grain and Forage Sorghums for Nebraska, by A. F. Swanson (pp. 194–206) (U. S. D. A. and Kans.); The Best Small Grains for Your Nebraska Farm, by C. A. Suneson (pp. 206–213) (U. S. D. A. and Nebr.); and The Part of Grass in the Husbandman's Program, by D. Marshall (pp. 240–244) (Ont.).

[Field crops research in Ohio] (*Ohio Sta. Bul. 579 (1937), pp. 18–30, 31–33, 61–63, 68, 118–122, 123, figs. 3*).—Experimentation with field crops (E. S. R., 75, p. 331) from which results are reported briefly was concerned with the effects of 20 years' cropping to different crop rotations on soil nitrogen and corn yields, by R. M. Salter; the merits of soybeans v. oats in the crop rotation, by L. E. Thatcher; comparisons of methods of summer seeding of seed mixtures, by C. J. Willard; the hill fertilization of corn, by E. E. Barnes; progress of the Ohio soil survey, by G. W. Conrey; the effect of closeness of grazing on the yield and stand of Kentucky bluegrass pasture, by D. R. Dodd; Thorne, a new red-chaffed, red-kerneled wheat for Ohio, by C. A. Lamb; experiments with hybrid corn, by G. H. Stringfield; the merits of Evergreen, a new late-blooming sweetclover, for pasture, by J. B. Park; the effectiveness of various chemicals as agents for the killing of weed seeds in seedbeds for lawns, by F. A. Welton; the effect of fertilizers upon the ash content of wheat, by E. G. Bayfield; the successful growth of corn in tank cultures, by J. D. Sayre and V. H. Morris; recovery of potato plants after severe injury from frosts, especially on muck soils, cooperative potato fertilizer experiments, subsoil treatments for potatoes, and a new, high-yielding, late variety of potato, all by J. Bushnell; variation in the yield of corn and mixed hay from different seasons on limed and fertilized plats, by M. A. Bachtell and W. Mahan; an experiment on fertilizing alfalfa at seeding time, by Willard and H. W. Rogers; the increase in crop yield due to tile drainage v. no drainage and surface drainage, by Bachtell and H. S. Elliott; potato rotations, by Bachtell and W. E. Weaver; time and method of fitting alfalfa sod for wheat, by Bachtell and L. W. Sherman; eradication of field bindweed, by Willard and R. C. Beatty; the merits of alfalfa-timothy meadow as summer and fall pasture for dairy cows, by Bachtell and H. Allen; comparative yields and duration of alfalfa, alfalfa-timothy, and alfalfa-orchard grass mixtures, by Bachtell and R. Hopkins; bluegrass pasture problems in western Ohio, by Bachtell and P. A. Jones; and rotations for tobacco, by Bachtell and H. M. Wachter. Certain lines of work were in cooperation with the U. S. Department of Agriculture.

The use of partial linear regression to analyze the curvilinear relationship between the yield of vegetable crops and the content of nutrients in the lower main stems, E. M. Emmert (*Jour. Amer. Soc. Agron., 29 (1937), No. 3, pp. 213–219, fig. 1*).—This is a contribution from the Kentucky Experiment Station.

The utilization of Wabash clay (gumbo) soils in crop production, B. M. King (*Missouri Sta. Res. Bul. 254 (1937), pp. 42, figs. 13*).—Crops of soybeans, rice, wheat, and oats were remarkably successful; winter barley (1934–36) made very high yields; whereas corn and clovers were mediocre or failed in most seasons in an experimental study of crop production on Wabash clay, commonly called "gumbo", centered on an 80-acre experiment field near Elsberry, Lincoln County, Mo., in cooperation with the U. S. Department of Agriculture. Varieties, cultural methods, and field practices are recommended for

growing the several crops on the basis of the experiments. The systems and methods of production on this field, it is pointed out, may be successfully repeated on other areas of Wabash clay and similar heavy bottom land in Missouri, provided such lands are protected from flood water and are given surface drainage sufficient to prevent rain water from standing in the fields for long periods.

A key to the grasses of Montana, based upon vegetative characters, C. L. Hitchcock (*Missoula: Author, [1937], pp. [3]+28, pls. 8*).—This manual provides a key to the genera and species of grasses of Montana, with appropriate illustrations.

A comparison of some methods used in determining percentage utilization of range grasses, J. F. Pechanec and G. D. Pickford (*Jour. Agr. Res. [U. S.], 54 (1937), No. 10, pp. 753–765*).—Tests at Dubois, Idaho, of six methods used in the determination of percentage utilization of native grasses showed that the general reconnaissance method is not accurate enough, the stem-count method is neither accurate nor rapid for use on bunch grasses, the measurement method is not rapid enough for field use and not accurate enough for a check on ocular estimates, and because of labor involved and use of paired plats, the volume-by-weight method is not practical for use under range practices. Recommendations are that ocular estimate methods, on plats of limited size, supplemented by comparison with determinations made by the modified volume-by-weight method should be considered for pasture or open-range studies.

Foreign strains of alfalfa and red clover: What is their adaptability to Illinois? J. J. Pieper and W. L. Burlison (*Illinois Sta. Bul. 431 (1937), pp. 473–503, figs. 12*).—Comparisons of foreign strains of red clover and of alfalfa with domestic strains during 15 yr. (1922–36) of tests on experimental fields located in different parts of Illinois demonstrated beyond doubt that the foreign strains, except those from Canada, are not adapted to Illinois conditions. Planting them results in losses through immediate crop failures and the production of inferior hybrid strains caused by cross-pollination with domestic varieties.

In the whole series of tests a foreign strain of alfalfa seldom produced yields as high as those of the domestic check strain. Some yielded less than 25 percent as much as the domestic variety. This also applied to the Argentine and Turkestan strains, which evidently were better than the other unadapted foreign strains tested. Foreign strains of alfalfa in general made much poorer stands than the domestic checks, and the plants were subject to more severe attack by insects and disease and were more easily winter-killed.

Domestic strains of red clover used as checks yielded from 50 to 600 percent more than the several foreign strains. The foreign seed germinated well and made good stands the first year, but stands were soon lost because of winter-killing and susceptibility to disease and insect injury. The true inferiority of the foreign strains, except from Canada, showed up in inability to produce a crop the second year.

"Periods of high importations of alfalfa and red clover seed have in the past been followed by high percentages of failure and by declining acreages of these crops in Illinois. Tariff barriers and Federal requirements for coloring imported seed have tended to reduce importations during recent years, but whenever price differentials between domestic and foreign seed are high enough to make importing profitable, seed may be expected to come in over the tariff barriers."

Procedures other than the importation and use of unadapted seed in times of shortage of domestic seed are suggested for Illinois farmers.

Influence of delayed harvest on certain varieties of oats and barley in Michigan, H. C. Rather (*Michigan Sta. Quart. Bul., 19 (1937), No. 4, pp. 241–246*).—Spartan, Wisconsin No. 38, Oderbrucker, and Glabron barleys, and Wolverine, Worthy, Markton, and Iogold oats were harvested 1931–33 beginning in the hard dough stage, i. e., first binder harvest, and continuing at about 3-day intervals for from 18 to 21 days.

Barley or oats which contains more than 30 percent moisture evidently has not yet attained maximum yield and will improve in yield and quality if let stand 3 or 4 days beyond the hard dough stage. The maximum yields of barley and oats were secured when the grain contained about 25 percent moisture with the grain and straw apparently fully ripe. Barley or oats left standing until dry enough for harvest with a combine will lose moderately in yield, and if combine harvest is delayed as long as 2 weeks from the fully ripe stage, losses will be rather severe. Spartan barley suffered the smallest losses due to delayed harvest and Oderbrucker the greatest losses. Markton oats appeared to shatter least of the oats varieties tested but lodged more readily than the others. Indications were that yield losses probably may be reduced materially if oats and barley are cut and windrowed at the fully ripe (25 percent moisture) stage, and cured in and threshed from the windrows with the combine.

Small grain and rye grass for winter pasture, R. H. Stansel, P. B. Dunkle, and D. L. Jones (*Texas Sta. Bul. 539 (1937), pp. 38, figs. 3*).—Experiments at the Angleton, Denton, and Lubbock Substations, in which wheat, oats, rye, barley, and ryegrass were sown in small plats and grazing simulated by clipping, showed the forage to be high in feed value, usually analyzing from 3 to 5 percent fat and about 25 percent protein at the beginning of the season and diminishing as the season advances. These crops have proved valuable for winter pasture and worthy of planting for their grazing value alone, although they are also (except ryegrass) dependable producers of grain.

Yields per acre measured in pounds of dry matter during the 4 yr. of the experiments have ranged up to 5,000 lb. for barley, 6,300 for wheat, 4,600 for oats, 4,400 for rye, and 6,900 lb. for ryegrass at Denton; up to 1,679 lb. for oats and ryegrass at Angleton; and at Lubbock around 3,000 lb. per acre for rye and almost as much for wheat, oats, and barley. Barley produced far more fall and early winter grazing than the other crops, but Italian ryegrass produced by far the largest amount of grazing in March, April, and May. Wheat, oats, and rye produced the best grazing for the midwinter months. The differences in rate of growth of the various crops indicate that maximum pasturage can be had by planting a mixture of the several crops. Wheat and ryegrass, more resistant than oats and rye to extreme cold, are preferable in north and northwest Texas, where grazing the wheat fields is already a common practice.

Grazing from these small grains becomes available in the fall just as the grazing from Sudan grass is declining and lasts well into the spring when the native grass pastures are ready for grazing. It usually is possible to change to native grass pasture from wheat and oats in time enough to avoid reducing the grain yields expected. At Denton, grazing up to March 1 improved grain yields and could have been continued 20 days with oats without damage to yields. At Lubbock, where 82 percent of the rainfall occurs between April and October, small grain for pasture is planted early in September and almost always yields some grazing, but generally it pays to withdraw the stock from pasture occasionally to allow the crop to recover.

Developing cutover pasture in the upper peninsula, B. R. Churchill (*Michigan Sta. Quart. Bul., 19 (1937), No. 4, pp. 227–232, figs. 6*).—An account of the success obtained by the Upper Peninsula Substation in developing pastures on cut-over land by burning over, pasturing with sheep, and seeding with appropriate mixtures.

Pasture renovation in relation to populations of white grubs, R. F. Fuelleman and L. F. Graber (*Jour. Amer. Soc. Agron., 29 (1937), No. 3, pp. 186–196, figs. 2*).—Renovation, i. e., the establishment of dry-weather legumes (alfalfa, sweetclover, and red clover) in permanent bluegrass pastures without plowing, practiced by the Wisconsin Experiment Station in parts of 30 old bluegrass pastures in 1934 and 1935, resulted in very small populations of white grubs (due to egg depositions of June beetles occurring in May and June), and injury was practically eliminated, while in adjacent unrenovated grass, grubs usually were plentiful. Compared with untreated grass, 15 renovations in 1934 reduced the grub populations by an average of 98 percent and renovations in 1935 by 91 percent. Renovation was much more effective in reducing the populations of white grubs when it preceded beetle flights of 1934 and 1935 than when it preceded that of 1935 only. Dense growths of dry-weather legumes reduced populations effectively, whether these plants were in the seedling or later growth stages.

Embryo mortality in relation to seed formation in alfalfa (Medicago sativa), D. C. Cooper, R. A. Brink, and H. R. Albrecht (*Amer. Jour. Bot., 24 (1937), No. 4, pp. 203–213, figs. 13*).—In further studies at the Wisconsin Experiment Station (E. S. R., 76, p. 782), detailed observations were made on 10 alfalfa plants, 5 high seed producers and 5 low seed producers, grown under the same environment, to determine some underlying causes for failure of seed production.

Failure to set seed where the flowers have been tripped to insure pollination seemed due to lack of fertilization even though pollen tubes are present, failure of pollen tubes to reach all ovules, and abortion of embyros at various stages of development. High seed-setting plants averaged 1.25 seeds per flower tripped and 2.13 seeds per pod formed, whereas low seed-setting plants produced 0.07 seed per flower tripped and 0.99 seed per pod.

Although all ovules appeared to be in a similar stage of development at the open flower stage, about 35 percent of those in the high seed-producing plants became fertile v. 25 percent in the other group. A greater proportion of ovules at the stylar end of the ovary become fertile than at the base, due to the growth of the pollen tubes. A high percentage of the fertile ovules fail to develop into mature seeds, e. g., an average of 3.1 ovules per flower in the high seed-setting group fertilized resulted in only 1.25 seeds per flower at maturity, and in the low seed-setting group the averages were 2.5 fertile ovules and 0.07 seed per flower, respectively.

Many of the embryos abort at an early stage, i. e., in the proembryo or early embryo stage. The embryos of the low seed-producing plants develop more slowly, the cells are more highly vacuolate, and a higher percentage of abortion takes place than in the high seed-producing group. Meiosis and development of the macrogametophyte is similar in the two types of plants, and starch is abundant in the embryo sacs of both types.

The effect of frequency of cutting on the yield of alfalfa under Hawaiian conditions, C. P. Wilsie and M. Takahashi (*Jour. Amer. Soc. Agron., 29 (1937), No. 3, pp. 236–241, fig. 1*).—Cutting experiments with Hairy Peruvian alfalfa, made at the Hawaii Experiment Station, 1934–35, showed that cutting in the full-bloom stage outyielded cutting in the one-tenth to one-fourth stage,

which in turn gave higher yields than cutting in the bud stage. Indications were that under such conditions as prevail in Hawaii, with a year-round growing season, alfalfa to be fed green as a soiling crop probably will do best both in yield and persistence if cut in the full-bloom stage.

Corn and corn growing, H. A. Wallace and E. N. Bressman (*New York: John Wiley & Sons; London: Chapman & Hall, 1937, 4. ed., rev., pp. VII+436, figs. 117*).—In this revision and enlargement of a book noted earlier (E. S. R., 60, p. 433), particular emphasis has been placed on revisions dealing with the economics and genetics of corn.

Competition between cotton varieties in adjacent rows, J. R. Quinby, D. T. Killough, and R. H. Stansel (*Jour. Amer. Soc. Agron., 29 (1937), No. 4, pp. 269–279*).—Data recorded in cotton variety tests, 1927–34, at the Chillicothe and Angleton, Tex., Substations and at the Texas Experiment Station to determine the necessity of protecting one variety from competition of another by using guard rows, i. e., whether or not single-row plats can properly be used, indicated that, as a general rule, cottons grown in variety tests in Texas do not differ in ability to compete for moisture and plant food. Therefore, it seems desirable to employ single-row plats and to use the land so saved for additional replications. However, since differences in competing ability may exist, a random distribution of plats and good stands are essential if single-row plats are adopted.

Responses from various sources of nitrogen fertilizer, W. R. Paden (*South Carolina Sta. Bul. 309 (1937), pp. 40, figs. 3*).—A strain of Cleveland cotton was grown continuously on Cecil sandy clay loam in small concrete-walled plats, receiving basal applications of superphosphate and potassium chloride (except where Ammophos, ammoniated superphosphate, and Nitrophoska were under test) and 15 different carriers as single sources of nitrogen and some of these in combinations. In 1928–30, the rate equaled 1,000 lb. of 5–10–4 fertilizer and in 1931–35, 600 lb. of 3.3–8–4. The soil, originally pH 5.58, was limed in two series at respective rates of 1,720 and 3,440 lb. of calcium hydroxide per acre. Rye was the winter cover on all plats except a few growing Austrian winter peas.

Only slight differences in soil reaction were observed following the use of the various nitrogen fertilizers. The average increase from lime was only 150 lb., or 7.5 percent, of seed cotton per acre, the greatest response from lime being secured with Milorganite, equivalent to 24.6 percent. On the unlimed plats the highest yield was secured from calcium nitrate and on the limed plats from cottonseed meal. No marked differences in the yields evidently are to be expected from use of various nitrogen sources on limed soil with a desirable reaction.

Certain single sources of nitrogen produced a higher average acre yield than their combination with cottonseed meal or with calcium cyanamide. From combinations with cottonseed meal and inorganic carriers on unlimed plats, the highest average yield was produced from a combination of nitrogen from cottonseed meal 30 percent, sodium nitrate 45, and ammonium sulfate 25 percent. Among similar combinations with calcium cyanamide the highest average yield was produced with nitrogen from calcium cyanamide 10 percent and from sodium nitrate 90 percent.

Applied at rates of 5 tons per acre each as nitrogen sources, 1928–35, green vetch produced an average of 2,610 lb. of seed cotton, cow manure 2,325, and no nitrogen 1,449 lb. Yields were increased slightly by use of 2 tons per acre of dry rye straw in combination with sodium nitrate, indicating that there was no serious temporary nitrogen starvation period from this combination.

Yields secured from Austrian winter peas in combination with varying amounts of sodium nitrate indicate that the amount of nitrogen in the fertilizer could be reduced about 50 percent without significantly affecting yields.

While considerable differences in the rate of accumulation of nitrate nitrogen were observed from use of the several materials, there was no close correlation between the rate of accumulation of nitrate nitrogen and the yield of crops.

Localization of pentosans in the resin glands of the cotton embryo, R. G. Reeves and J. O. Beasley (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 9, pp. 711–718*).—Further studies (E. S. R., 69, p. 203) at the Texas Experiment Station, involving many microchemical tests on leaves and embryos of upland cotton, gave strong indications that the resin glands are the chief containers of whatever pentosans are present in the cotton embryo.

Photoperiodism, a factor in determining the manurial efficiency and distribution of Crotalaria juncea, B. N. and S. N. Singh and M. B. Srivastava (*Jour. Amer. Soc. Agron., 29* (*1937*), *No. 2, pp. 123–133, figs. 5*).—The influence upon the green manurial value of *C. juncea* of different exposures to light was considered in further studies (E. S. R., 75, p. 477). The data were also analyzed in the light of Blackman's law of limiting factors (E. S. R., 74, p. 15) with a view to studying the light requirements of crotalaria and its energy economizing power.

With prolongation of time of light exposure, increase in the physical characters was observed, viz, plant height, number of leaves per plant, leaf area, root length, number and weight of root nodules, and length and yield of fiber. Certain characters attained their maximum development under continued illumination, while others required only 20 hours' exposure, longer exposure resulting in solarization. The critical light period for crotalaria apparently falls within the zone of a 16- to 20-hr. day. Beyond this range flowering was completely suppressed, the plant remaining purely vegetative. The crop's manurial efficiency rose with an increase in the length of the photoperiod, attaining its highest value under 20 hours' exposure.

During the early half of its life cycle crotalaria seems to require less light and plants growing under longer exposures cannot economize the entire energy falling upon them, but with further advance in age the light requirements increase. From these observations it is concluded that a photoperiod of from 16 to 20 hr. considerably increases the crop's manurial efficiency. If other environmental factors do not interfere, crotalaria can successfully be introduced as a green manure crop into regions with long periods of daylight and it may be grown to advantage in mixtures of early maturing crops.

[Potato production in Nebraska] (*Nebr. State Bd. Agr. Ann. Rpt., 1936, pp. 682–700, 703–731, 737–747, figs. 6*).—Papers presented at the 1936 meeting of the Nebraska Potato Improvement Association included A Review of the Disease Problems Confronting the Nebraska Growers of Certified Seed Potatoes, by R. W. Goss (pp. 682–690), Grade Defects—Their Prevalence in Nebraska Potato Stocks and Methods of Eliminating Them, by H. O. Werner (pp. 691–700), Practical Crop Rotations for Irrigation Potato Farmers, by L. Harris (pp. 703–707), and The Relation of Rainfall Distribution, Soil, Moisture, and Crop Rotation to the Yield of Potatoes at the Box Butte Experiment Farm, by H. O. Werner (pp. 715–731) (all Nebr.); Seasonal Uses of Water by Potatoes and Other Farm Crops Under Irrigation, by L. Bowen (pp. 707–714) (U. S. D. A.); and Maintenance of Organic Matter in Dry-Land Soils, by L. L. Zook (pp. 737–747) (Nebr. and U. S. D. A.).

Cellar and cold storage of sound and mechanically damaged Triumph seed potatoes, H. O. WERNER (*Nebraska Sta. Res. Bul. 88 (1936), pp. 59, figs. 25*).—The relative desirability of cellar storage or cold storage during various periods was determined by considering the weight loss when Triumph potatoes were stored in crates and their field performance when planted.

The storage of sound potatoes.—Cold storage from harvest to planting resulted in less weight loss and in a higher percentage of sound potatoes than did cellar storage. With late-June planting, emergence was slightly slower from cold storage than from cellar-stored potatoes, but the stands and total yield were better. Cold storage within a few weeks or just after harvest, if continued until a week or two before planting, generally resulted in increased weight losses, because of greater rotting, but did not appear to affect yields the next year. When potatoes were placed in cold storage about the time cellars began to warm up or about when buds began to elongate into sprouts (in April), the most desirable and economical method used, losses due to sprout growth and decay were not serious, the percentage of sound tubers was almost as great, and yields were about as high as with longer cold storage. Cold storage beginning in late May or early June was less desirable than earlier transference to cold storage but preferable to continual cellar storage, provided sprouting was not advanced too far. When cold storage was begun in the fall, its continuance until early June was found desirable. A warming up period in the cellar of 2 or 3 weeks instead of from 5 to 7 days before planting increased weight losses, sprout growth, and usually the amount of decay, but generally did not increase yields significantly. Cold storage in spring was more essential for potatoes subjected to fall cold storage than for those that had fall cellar storage.

Storage losses under various treatments always were greater with immature tubers than with sound, mature tubers. Best stands and highest yields were generally secured from seed in which sprout growth was well initiated throughout the tuber. Solid, almost completely dormant potatoes produced better stands and yields than tubers severely shriveled because of extensive loss of water and sprout growth. Potatoes stored in sacks lost less weight during the fall and winter but more in the spring than those stored in crates. There was less sprout growth and rot with crate storage, probably due to differences in aeration.

The storage of mechanically damaged potatoes.—Weight losses were always greater with mechanically injured (E. S. R., 66, p. 31) than with sound potatoes stored under the same conditions. Under best conditions, sound potatoes in June constituted from 85 to 89 percent of the October weight with whole potatoes as compared with from 56 to 68 percent when tangentially cut tubers were stored. With cut potatoes, differences in weight loss generally were accounted for by the amount of rot. Losses in storage rose as the severity of the damage to tubers increased—the severity increased with the area of the cut or damaged surface. Exposure of cut potatoes to sunshine increased weight loss and amount of rot, especially as exposure was prolonged. Exposures to sunshine of from 4 to 8 hr. resulted in almost complete destruction of the potatoes by June when cellar storage was used. With cut surfaces turned away from the sun, exposure resulted in more loss than when cut tubers were taken into the cellar at once, but much less than when cut surfaces were toward the sun. Subsequent loss increased with length of exposure of such cut tubers to the dry air, wind, and sun. As the humidity of the cellar rose, the less was the weight loss and percentage of rot.

Cold storage any time before April 1 always resulted in increased weight loss and rot. Freshly cut potatoes held in a cellar 1 week and then moved to cold storage lost less weight than when put into cold storage just after cutting or if held in cold storage for only the first week just after cutting. Cellar storage until April 1 and cold storage after that gave satisfactory results but not much better than continual cellar storage. When potatoes were cut into seed-size pieces in early October, about half of the original weight remained as sound seed pieces by June 15. The losses generally increased as the severity of the exposure increased, due either to more time, brighter sunshine, less humidity, or more wind. Effects of exposure temperature were less apparent within the range of conditions experienced.

Studies in yield comparisons of rice, S. C. PEH (*Jour. Amer. Soc. Agron., 29 (1937), No. 3, pp. 167–185, figs. 2*).—Spacing experiments with rice at Lingnan University, Canton, China, 1934–35, showed yields to increase with closer spacings. Significant differences between yields were not observed when from 5 to 18 plants per hill were used. Indications were that for a fairly high yield the number of plants per hill should increase as the distance between hills is greater.

Effect of variety, maturity, and soundness on certain soybean seed and oil characteristics, J. F. O'KELLY and M. GIEGER (*Mississippi Sta. Tech. Bul. 24 (1937), pp. 10*).—Analyses revealed that in comparison with Mammoth Yellow, Biloxi, and Otootan soybeans grown under similar conditions, 1925–30, 1932, and harvested after threshing, Laredo had less fat and protein and more nitrogen-free extract and fiber and usually a higher refractive index and iodine absorption number.

Selections of Edible (in 1935) and of Mammoth Yellow (in 1933) soybeans were harvested when pods were green, mature, and dry enough for normal harvest. Beans harvested before maturity contained higher percentages of fat, protein, and fiber and lower percentages of nitrogen-free extract and often of ash than mature beans. Oil of these immature beans had a slightly lower refractive index and a considerably lower iodine number than the oil of mature beans, but saponification number showed no distinct trend.

Comparison of damaged and badly decayed soybeans of several varieties, the results of simulated harvesting and storage hazards, with sound beans, showed that as decomposition progressed the percentages of fat and protein increased and the percentage of nitrogen-free extract decreased, largely due to the decomposition of nitrogen-free extract. Increases in the refractive index were slight but the iodine number decreases were considerable. Decomposition of nitrogen-free extract and the formation of free fatty acids proceeded more slowly in a limited supply of oxygen than in a liberal supply. Germination seemed to produce the same changes as decay except that the iodine number was increased.

Besides the practical value of the findings as related to soybeans grown for oil, they are held to indicate the importance of proper methods of sampling for analyses.

Soybeans in the Northeast, R. G. WIGGANS (*Jour. Amer. Soc. Agron., 29 (1937), No. 3, pp. 227–235*).—Certain experimental results obtained at the [New York] Cornell Experiment Station in growing soybeans for hay, for silage (E. S. R., 74, p. 329), and for grain indicated that the place of the soybean plant in northeastern agriculture is not entirely clear, but is promising enough to justify further studies within the area and further quest for more and better varieties suitable for the conditions. Planting tests with Cayuga soybeans, 1934–36, indicated that nine plants per square foot approaches closely

to the optimum rate with this variety and within the experimental limits, regardless of the row width.

Relation of nitrogen to yield of sugar-beet seed and to accompanying changes in composition of the roots, L. M. Pultz (*Jour. Agr. Res.* [U. S.], *54* (*1937*), *No. 9, pp. 639–654, figs. 4*).—When U. S. No. 1 sugar beets, grown at St. George, Utah, received heavy applications of ammonium sulfate, increased yields of seed came from plants overwintered in the field, but the quality of the seed was not affected. Variations in date-of-planting and thinning modified the effects of the fertilizer. The nitrogen treatments evidently resulted in increased accumulation of sugar in the roots during the fall and in increased utilization of sucrose during the fruiting period in summer. Unfertilized plants accumulated sucrose during the summer and had a much abbreviated period of flower production.

Highly significant negative correlations were established between sucrose percentages in the roots at time of seed harvest and seed yields. The utilization of stored reserves in the sugar beet root has been found to depend upon the supply of nitrogen available to the plant during the fruiting period.

The influence of some climatological factors on seed-stalk development and seed yield of space-isolated mother beets, H. L. Kohls (*Jour. Amer. Soc. Agron.*, *29* (*1937*), *No. 4, pp. 280–285*).—The influence of temperature, precipitation, relative humidity, and hours of sunshine, 1926–27 and 1929–35, upon the percentage of beets that produced seed stalks and seed yield of space-isolated mother beets (E. S. R., 74, p. 33) was studied at the Michigan Experiment Station in cooperation with the U. S. D. A. Bureau of Plant Industry. Periods and weather conditions found most favorable to a high percentage of beets with seed stalks comprised a cool (less than 69.4° F. maximum temperature), wet (more than 1.68 in. of rain), cloudy (less than 10.6 hr. of sun per day) May 16–31, with similar weather extending into the last half of June; and those most favorable to a high yield of seed were the same periods and conditions especially favoring seed stalk development and a cool (less than 81.4° maximum temperature), dry (less than 1.06 in. of rain) July 1–15.

The coumarin content of Melilotus dentata, R. A. Brink and W. L. Roberts (*Science*, *86* (*1937*), *No. 2219, pp. 41, 42*).—The nonbitter form of *Melilotus* (E. S. R., 71, p. 471), reported from the Wisconsin Experiment Station, was identified as an annual flowering form of the typically biennial *M. dentata*, a species occurring sparingly from central Europe eastward to central Asia, usually on salty soils. Examination of 28 different lots (27 biennials), mostly from central Europe, showed that all are free of the characteristic bitter taste of common white sweetclover *M. alba*, and common yellow sweetclover, *M. officinalis*. No coumarin, melilotic acid, or coumaric acid were detected in the vegetative tissues of *M. dentata* at the flowering stage, and if these substances are present at all in the leaves and stems the amounts are less than 0.001 percent. *M. officinalis* at the same stage of development contained coumarin 0.65 percent, melilotic acid 0.25, and coumaric acid 0.036 percent, and corresponding values for *M. alba* were 0.36, 0.27, and 0.048 percent. A small amount of coumarin is present in seed of *M. dentata*, three stocks (Peiping, Copenhagen, and Moravia) showing 0.021, 0.074, and 0.04 percent, respectively, on the dry basis, while *M. officinalis* seed contained 0.63 percent and *M. alba* 0.46 percent.

Changes in breaking strength of straw of wheat varieties from heading to maturity, A. T. Bartel (*Jour. Amer. Soc. Agron.*, *29* (*1937*), *No. 2, pp. 153–156, fig. 1*).—Breaking strengths data were obtained on straw of Sonora, Baart, and Marquis wheat grown under irrigation at the Arizona Experiment Station,

1932–35, and cut close to the ground on alternate days from 6 days before one-tenth of the spikes were emerged until maturity. Salmon's technic and apparatus (E. S. R., 65, p. 734) were employed.

The data indicated that major differences in breaking strength may be determined on samples of straw harvested at any comparable stage from full heading to maturity when the varieties head on about the same date. However, breaking strength may be affected by environmental conditions under which plants grow. Thus, a late wheat grown under adverse conditions might be lower in breaking strength in comparison with other varieties than if all varieties grew under uniform environmental conditions.

The wheat meal fermentation time test with special reference to its reliability as a measure of quality in soft winter wheats, G. H. Cutler and W. W. Worzella (*Jour. Amer. Soc. Agron., 29 (1937), No. 3, pp. 220–226*).—Statistical studies made on comparable data derived from quality tests on 12 soft and semihard varieties of wheat grown at three locations in Indiana, 1930–33, and on 12 typical soft wheat varieties grown at the Indiana Experiment Station, 1931–34, revealed that the fermentation time test (E. S. R., 75, p. 776) appraised accurately the gluten quality of these wheats, giving consistent results from one year to another at all locations. Small differences were found in protein content and loaf volume in the soft wheats studied. These analyses and favorable results by other investigators indicate that the fermentation time test may be a reliable guide in measuring the relative gluten quality of soft winter wheats.

Aplopappus fruticosus or burro weed, B. I. Judd (*Jour. Amer. Soc. Agron., 29 (1937), No. 4, pp. 332–334, fig. 1*).—Preliminary control experiments by grubbing and burning are reported.

HORTICULTURE

[Horticultural investigations at the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 393 (1937), pp. 169, 190–193, 200*).—There are included brief progress reports on studies of spray residue on fruit, heredity in sweet corn, the development of hybrid varieties of sweet corn, the breeding of strawberries, improvement of squash by hybridization and selection, breeding of garden beets and peppers, and studies of the soil reaction requirement of different vegetables.

Eight-year summary of horticultural investigations, J. C. Miller and W. D. Kimbrough (*Louisiana Sta. Bul. 287 (1937), pp. 29, figs. 8*).—Summaries are presented on the results of investigations, from 1929 through 1936, which for the greater part have been reported previously in greater detail. The crops discussed include asparagus, beans, cabbage, carrots, collards, okra, onions, peas, peppers, potatoes, sweetpotatoes, squash, tomatoes, oranges, strawberries, and tung oil.

[Horticultural investigations conducted by the Maryland Station] (*Maryland Sta. Rpt. 1936, pp. XXXII–XXXIV, XXXV, XXXVI, XXXVIII–XLI*).—Included are brief progress reports upon studies dealing with the physiological and biochemical changes in vegetables in storage (notably Hubbard squash); the polysaccharides in sweet corn; asexual propagation of the apple; cytogenetic studies in *Ipomoca, Gladiolus,* and *Tulipa;* effect of culture on organic matter in orchard soils; the thinning of Concord grape clusters before blooming; peach pruning; effect of shade on the color of apples; spacing of strawberry plants; new varieties of fruits; canning tests of peas; effect of temperature on coloring of the tomato; relation of the plane of nutrition to yield of snap beans; culture

of vegetables at higher altitudes in the State; cut-off yields of various sweet corn hybrids and varieties; mulching of rhubarb with soybean hay; effect of cyanamide applied December 1 on subsequent crops of peas, lima beans, and wheat; selection of hardy strains of Virginia Savoy spinach; testing of rust-resistant snapdragons; and observations on bud drop in sweet pea varieties.

[Horticultural studies conducted by the Nebraska Station] (*Nebraska Sta. Rpt. [1936], pp. 19, 20*).—Brief reports are presented on the water requirements of apple trees, the effect of drought on the growth and distribution of fruit tree roots, and the root development and water requirements for asparagus.

Report of the division of horticulture, M. B. Davis (*Canada Expt. Farms, Div. Hort. Rpt., 1931–33, pp. 144*).—Included in this general report (E. S. R., 66, p. 827) are the results of studies in fruit breeding; the nutritional requirements of fruits and vegetables; varieties of fruits and vegetables; pollination, propagation, and utilization of fruits; and cultural experiments with vegetables and ornamental plants.

Importance of organic matter in potting soils, C. E. Hoxsie (*Michigan Sta. Quart. Bul., 19 (1937), No. 4, pp. 238–241, fig. 1*).—In an attempt to produce poinsettia plants with large, showy blossoms, various fertilizer and organic matter treatments were followed. Of 24 plants grown in the soil and peat mixture, 15 attained a height of 30 cm or more, as compared with only 8 in the series which did not receive peat. With respect to the retention of foliage, the superiority of the plants receiving peat was striking. The addition of peat to the soil apparently permitted better penetration of water with more uniform distribution.

[Vegetable studies conducted by the Ohio Station] (*Ohio Sta. Bul. 579 (1937), pp. 59–61, 63–68, figs. 2*).—Information is presented on the water requirements of several vegetable crops, by D. Comin and J. D. Wilson; culture of garlic, and methods of applying fertilizer to sweet corn, both by Comin; the structure of tomato blooms, and the effect of supplemental illumination on the tomato, both by F. S. Howlett; effect of varietal, cultural, and other treatments on the content of mineral salts and vitamins in the tomato fruit, by I. C. Hoffman; and variety tests of tomatoes, by H. D. Brown and O. N. Riley.

The response of celery to manures and fertilizers, F. K. Crandall (*Rhode Island Sta. Bul. 260 (1937), pp. 22, figs. 4*).—Over a period of 18 yr. two 3-yr. rotations, one including stable manure in different amounts plus other fertilizers, and the second green manure crops plus fertilizers, were compared on a fine sandy loam soil the entire area of which had been treated with limestone to overcome acidity. On the whole, a striking response was found to stable manure as compared with green manures such as oats, clover, rye, wheat, and timothy. Comparisons between 8, 16, 24, and 32 tons of stable manure indicated that applications in the region of 16 tons are highly effective, but above this point the manure may become unprofitable unless obtainable at a very low cost. Attempts to substitute local peat composted with lime as a source of organic matter were not highly successful, the yields being about two-thirds of those secured with stable manure. Green manure plus fertilizer was not equal to stable manure plus fertilizer, but the results were sufficiently promising to encourage the grower who has no supply of stable manure. Increasing or decreasing the nitrogen content of the fertilizer used with stable manure resulted in significant changes in yield—more so than when used with green manure crops. Varying the phosphate content had no great effect on yield, suggesting that celery has a wide range of phosphorus utilization. Consistent effects were secured by modifications of the potash content of the supplemental fertilizer.

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Bulb formation in some American and European varieties of onions as affected by length of day, R. MAGRUDER and H. A. ALLARD (*Jour. Agr. Res. [U. S.], 54 (1937), No. 10, pp. 719–752, figs. 9*).—This is a more detailed presentation of the results of an investigation previously noted (E. S. R., 77, p. 188).

Anatomy and histology of the transition region in Capsicum frutescens, H. L. COCHRAN and F. F. COWART (*Jour. Agr. Res. [U. S.], 54 (1937), No. 9, pp. 695–700, pls. 5, fig. 1*).—Using as material greenhouse-grown plants of the Perfection pimiento, the authors compared at the Georgia Experiment Station the changes that take place in the root-stem transition with that of several other members of the Solanaceae family hitherto studied. The results were said to be in full accord with those of Artschwager for *Solanum tuberosum* (E. S. R., 39, p. 629) as far as the phloem is concerned, but disagree with his findings regarding the xylem. The results of the study are presented in detail with supporting photomicrographs.

The yield complex of sweet corn, I, II, W. A. HUELSEN and W. H. MICHAELS (*Illinois Sta. Bul. 432 (1937), pp. 505–608, figs. 20*).—Seeking information that would be helpful from the standpoint of the cannery-contract grower, for establishing a basis for the determination of the proper degree of maturity for harvesting sweet corn, studies were carried on over 2 yr., 1931-32, with three varieties, Country Gentleman, Narrow Grain Evergreen, and Golden Bantam. The results are presented in two parts, as follows:

I. *Effect of advancing maturity* (pp. 511–581).—This study presents evidence that none of the three methods—(1) penetrometer reading, (2) moisture determination, and (3) the alcohol-insoluble residue test—is of material value to the grower. On the other hand, the percentage of dented ears was found a ready index. The first appearance of dented ears in Country Gentleman and Narrow Grain Evergreen occurred when the moisture content averaged 69.6 and 70.1 percent, respectively. The order in which a field of sweet corn matures, as indicated by the moisture content at the time when the yield of each component reaches a maximum was as follows in Country Gentleman and Narrow Grain Evergreen: (1) Number, weight, and percentage of prime husked ears, which is followed very closely by (2) weight and percentage of prime cut kernels, which coincides with the first appearance of dented ears, and (3) number and weight of sorted unhusked ears. The fact that sorted unhusked ears reached their maximum weights later than the other components is said to be a factor of major importance. Where tenderness is the objective, harvesting must be early because of the practical difficulty in grading ears into two grades, "whole-grain" and "cream-style" maturity.

II. *Correlation analysis of the yield complex in sweet corn* (pp. 581–600).—This section presents evidence that the principal yield components are closely associated. Sorted unhusked ears, prime husked ears, and prime cut kernels were closely associated, with prime husked ears and cut kernels, and also cobs, showing the closest correlation. Increases in mean ear weights are not associated generally with higher acre-yields. Mean weight per ear was only slightly correlated with the number of ears per acre. Increases in the yields of both ears and of cut kernels were accompanied usually by decreases in the weight of husked culls. Yields of cut kernels may be estimated from the yield of prime husked ears with sufficient accuracy for commercial purposes.

Sweet corn varieties and strains, R. G. ROTHGEB (*Canning Trade, 58 (1936), No. 39, pp. 10, 12*).—Information is presented on the yields of husked marketable ears, effects of rate and date of planting, etc., based on trials conducted by the Maryland Experiment Station.

Cut-off data for sweet corn varieties, H. B. Cordner (*Canning Trade, 58 (1936), No. 39, p. 14*).—Variety comparisons conducted for 2 yr. at the Maryland Experiment Station indicated that Golden Cross Bantam, Country Gentleman, and Top Cross Bantam yielded the highest cut-off, ranked in the order given.

Effects of carbon arc light on the chemical composition and vegetative propagation of tomato plants grown with a limited supply of nitrogen, J. W. Mitchell (*Plant Physiol., 11 (1936), No. 4, pp. 833–841, figs. 3*).—"The total carbohydrate content of the above-ground portion of tomato plants increased approximately 400 percent during a 10-day period in which the plants were grown with a nitrogen-free nutrient and exposed 12 hr. daily to light from a carbon arc lamp. In plants given a limited supply of nitrogen and illuminated with artificial light daily, sucrose, starch and dextrin, and polysaccharides concerned in the thickening of cell walls accumulated rapidly at first, then more slowly after several days of illumination, while the percentage of reducing sugars changed very little during the experiment. This decrease in the rate at which carbohydrates accumulated in the plants was accompanied by yellowing and abscission of the older leaves, thus decreasing the total leaf area per plant. This reduction in photosynthetic tissues may have been in part responsible for the decreased rate of carbohydrate accumulation during the latter part of the period in which the plants were grown in artificial light. There was an increase in the production and growth of roots by cuttings made from tomato plants grown in natural light of low intensity after the plants were exposed to arc light prior to making the cuttings. Cuttings made from such irradiated plants were less subject to decay than those taken from plants grown in natural daylight of low intensity during winter."

Seedlessness in tomatoes, L. R. Hawthorn (*Science, 85 (1937), No. 2199, p. 199*).—Stating that in the winter garden region of Texas most varieties of tomatoes will with irrigation grow throughout the summer without setting any fruit, the author reports that in a cross between Large Cherry and Bonny Best, made by the Texas Experiment Station, there were some promising seedlings which set fruit during midsummer. During the hottest period the fruits became seedless, although earlier and later in the season seed production was normal.

Factors affecting the amount of puffing in tomatoes, S. H. Yarnell, W. H. Friend, and J. F. Wood (*Texas Sta. Bul. 541 (1937), pp. 64, figs. 6*).—Experiments carried on in the greenhouse and field at the station and in the field under irrigation at the Weslaco Substation indicated that although environmental factors, such as soil moisture, air temperature, fertilization, and pollination, influenced the amount of puffing in tomatoes, the use of varieties and strains selected for their ability to produce normal fruits under southern conditions and the development of new low-puffing varieties by breeding seems to offer the only practical solution to the problem. The proportion of affected fruits varied greatly, from 0 to 100 percent, depending on hereditary and environmental factors.

Under controlled greenhouse conditions, when high temperature was not a factor, plants with low available moisture produced less puffed fruits than did those with abundant moisture. The differences were most marked in the early fruiting period. The same relationship was found in only a part of the irrigation experiments at Weslaco. A general positive relationship was observed between the amounts of rainfall and of puffed fruits. Plants sprayed with bordeaux mixture alone had less puffed fruit than comparable plants

sprayed with bordeaux plus heavy oil. Where maximum temperatures in the greenhouse exceeded 100° F., puffing approached 100 percent, irrespective of water treatments. When maximum temperatures remained below 100° there was some indication that low temperature in March contributed to puffing.

In regard to nutrition, plants grown in soil obtained from the north behaved no differently as to puffing than those grown in local soil. However, less puffing was noted in every case at the station where a 6–12–6 fertilizer was used. At Weslaco, fertilizers had inconsistent effects and supplements containing magnesium or iron had no significant influence. No correlation could be established between the occurrence of puffing and pathogenic troubles. Hand pollination of Marglobe in the field reduced the amount of puffing and probably explains excessive puffing at temperatures above 100°.

From the genetic aspect, small-fruited tomatoes, with the exception of Pomodora, had little or no puff. Among large-fruited varieties, considerable differences were noted, Kanora, Marketeer, and Success being examples of low-puffing and Marglobe of high-puffing varieties. Differences were also noted between strains of single varieties. Observations on crosses between suscepts and nonsuscepts indicated that several hereditary factors, for the most part recessive, are involved.

[Pomological investigations conducted by the Ohio Station] (*Ohio Sta. Bul. 579 (1937), pp. 54–58, fig. 1*).—Brief progress reports are presented on apple breeding, by F. S. Howlett; control of fire blight, and the length of prebloom spraying period in apples, both by C. W. Ellenwood; the comparative resistance of peach, grape, and plum varieties to winter cold, distribution of peach roots in different soils, and the effects of different systems of culture on the number and diameter of raspberry canes, all by L. Havis.

A fruit circumeter, A. F. Pillsbury and O. C. Compton (*Calif. Citrogr., 22 (1937), No. 4, pp. 151, 156, figs. 2*).—The construction and use of a circumference gage developed at the Citrus Experiment Station, Riverside, are discussed.

Soil organic matter and porosity of an orchard soil under different cultural systems, L. Havis and J. H. Gourley (*Soil Sci., 43 (1937), No. 6, pp. 413–420, fig. 1.*)—Determinations at the Ohio Experiment Station by the chromic acid method of the organic matter in soils from orchards maintained for many years under (1) tillage with cover crops, (2) mulch, and (3) bluegrass sod showed about the same content of organic matter under the mulch and sod with a much lower content in the cultivated section despite the plowing under of cover crops. Using volume-weight and rate of water absorption as a measure of water, mulch, sod, and cultivation were arranged in descending order of porosity. In each case the difference between the results under cultivation and under sod was greater than those under sod and under mulch.

Root development of 25-year-old apple and pear trees [trans. title], T. Roemer and F. Hilkenbäumer (*Kühn Arch., 42 (1937), pp. 281–303, figs. 37*).—An examination of the root systems of six varieties of pear worked on quince and of four varieties of apple worked on Golden Metz Paradise rootstocks showed in the apple the greater amount of the roots to be located in the 30–50 cm soil zone and in the pear in the 25–40 cm zone. There was noted a definite influence of the scions on the root development, in the amount of fibrous roots, and in the structure and form of the root development. The influence of the scions appeared to be qualitative rather than quantitative. The knowledge of root growth is believed useful in establishing cultural and fertilizer practices with fruits.

Cultural systems for the apple in Ohio, C. W. Ellenwood and J. H. Gourley (*Ohio Sta. Bul. 580 (1937), pp. 33, figs. 10*).—Stating that various systems of orchard culture are in use in Ohio and that there are more commercial apple

orchards in sod or some permanent cover than under any other system, the authors bring together the results of long-time investigations carried on in different parts of the State. Yields were maintained at a satisfactory level in a mixed-variety orchard at Wooster which had been in mulch for many years. Comparisons in a Stayman Winesap-Delicious orchard planted in 1915 and immediately given differential cultural treatments showed, at the end of 1935, greater production of Stayman Winesap and less of Delicious in the tilled cover-cropped than in the mulched area. Color was affected very slightly. Size of fruit was larger on the mulched area. Cost of production on a bushel basis was about the same, and growth was not greatly different. Soil temperature was higher during summer and lower during winter in the tilled area. The date of full bloom for both varieties was the same on both areas. In August of the very dry year of 1930, moisture was much higher beneath the mulch.

Studies of root distribution and penetration under different cultural treatments showed no tendency toward shallow rooting in mulched orchards. There was observed a downward and outward gradient of roots from the trunk and a tendency of the roots to spread rapidly over the whole orchard area, suggesting the advisability of wide-spread applications of fertilizer.

Based on the results, information is presented on tile drainage, cover crops, cultivation implements, prevention of erosion, the maintenance of organic matter, etc.

Blooming and ripening dates with yields of 360 varieties of apples grown at Mountain Grove, Missouri, P. H. Shepard (*Missouri Fruit Sta. Circ. 25 (1937), pp. 15*).—The data are presented chiefly in tabular form and show that among well-known apple varieties Willow Twig, York Imperial, and Golden Delicious were the most productive kinds with average yields of 240, 220, and 220 bu. per acre, respectively.

Spray residue on apples, R. H. Robinson (*Indus. and Engin. Chem., 28 (1936), No. 4, pp. 455–457, fig. 1*).—In this contribution from the Oregon Experiment Station, the author discusses the present status of research on the removal of toxic residues from apples, and suggests that heavily sprayed waxy fruits that cannot be cleaned by the usual hydrochloric acid and sodium silicate treatments may be washed effectively in acid solution supplemented by petroleum oil. White oils that have a sulfonation test of 90 or above and a viscosity between 40 and 50 Saybolt are recommended. A temperature between 100° and 105° F. should be maintained for maximum effectiveness. Wetting or degumming agents when used properly in combination with hydrochloric acid increased the solvent action of the acid in the spray residue.

Types of peach buds in relation to nursery practice, W. H. Upshall (*Sci. Agr., 17 (1937), No. 7, pp. 445, 446, fig. 1; Fr. abs., p. 446*).—A comparison made at the Horticultural Experiment Station, Vineland, Ontario, between single and double or triple buds taken from bearing trees of Valiant, Veteran, and Elberta varieties showed, in the first two varieties, striking gains in the percentage of developing buds in favor of the double and triple bud groups. It is recommended that nurserymen do not use plump single buds from bearing peach trees.

Embryo abortion in the peach in relation to chemical composition and season of fruit ripening, H. B. Tukey and F. A. Lee (*Bot. Gaz., 98 (1937), No. 3, pp. 586–597, figs. 2*).—Embryos of 10 peach varieties with seasons extending from early to late were examined and chemically analyzed at or near fruit maturity, and, for comparison, embryos of a single late variety (Elberta) were analyzed periodically throughout the season.

Elberta embryos were flaccid during the second stage of fruit development, so that the seed became shriveled when removed, but at maturity the embryos were firm and completely filled the integuments. Embryos of the earliest-ripening sort were abortive and disintegrated at fruit ripening, while those of each successively later-ripening variety were larger, firmer, and more nearly filled the integuments. At fruit ripening, embryos of a late-ripening sort contained 45.03 percent of moisture, 30.67 of fat, 2.6 of nitrogen, 2.32 of sucrose, and 0.23 percent of reducing sugars. Embryos of early-ripening varieties exhibited a higher moisture content and lower contents of fat, nitrogen, reducing sugars, and sucrose. There was a steady increase in growth, moisture loss, and accumulation of stored materials in embryos of all varieties, and an abrupt check in these processes as the ripening date for each successive variety was reached. If the moisture, fat, and nitrogen contents of the embryos are plotted with reference to time of ripening, the composite graph is similar to that for the development of a single variety. The close similarity observed in the growth of embryos of different varieties, regardless of the fruit ripening season, extends as well to the chemical changes within them.

Delayed thinning as an aid in controlling the gumming of the Phillips Cling peach, L. D. Davis (*California Sta. Circ. 341 (1937), pp. 14, figs. 11*).—Together with certain related portions of the case history of the disease, information is presented on a practical control which was found to reduce the incidence of the disease by from 80 to 90 percent. Four types of gumming, (1) the result of injury from insects, limb rub, etc., (2) early suture gumming, (3) distal and dorsal, and (4) late ventral, are described and discussed. The first type is not specific to the Phillips Cling, the second occurs more frequently on Phillips Cling than on other varieties but is relatively rare, the third is by far the most frequent, and the fourth is moderately abundant. The period of gumming was found consistent from year to year, and from 85 to 90 percent of the injury occurred in the 35-day period following the beginning of the time that the pit begins to harden at the tip and about three-eighths of an inch along the ventral suture. This stage may be determined by the resistance offered to a sharp knife and by an examination of the ovule or kernel. The addition of 2 weeks to this pit-hardening stage, designated in the text as the reference date, determined fairly accurately the beginning of the severe gumming period. By delaying thinning until most of the gumming had taken place, practical control was obtained for two reasons—(1) a heavy set of fruit on the tree during gumming apparently protects a certain number of fruits from the injury, and (2) thinning after most of the injury has occurred permits the removal of the gummy fruits.

Peach production in Ohio, L. Havis and J. H. Gourley (*Ohio Sta. Bul. 581 (1937), pp. 41, figs. 10*).—Including the results of pertinent investigations, this bulletin presents general information for the orchardist with regard to economics, propagation, favorable locations, varieties, planting, soil management, root distribution in different soils, fertilizers, pruning, fruit thinning, winter injury, and harvesting and marketing.

In a fertilizer study conducted at Danbury on a soil of rather poor native fertility, nitrate of soda, sulfate of ammonia, and nitrate of potash all gave good results, the yields from equivalent amounts of nitrogen being much the same. Splitting the application into an April and June treatment exerted no noticeable effect on tree growth or yield. Tankage plus bonemeal did not prove as effective as did the inorganic materials. Nitrogen fertilizer greatly improved the set of fruit from about 17 percent on the nonfertilized to 30-odd percent on the treated trees. Applications of inorganic nitrogen delayed ripen-

ing from 3 to 7 days, while in 2 or 3 yr. organic nitrogen had little or no effect. Nitrogen, except in 1 yr., 1925, failed to influence greatly the size of peaches but did increase the actual number of bushels of peaches in the larger grades. Inorganic nitrogen improved the keeping quality of peaches slightly.

A pruning experiment in a young peach orchard on Catawba Island showed that heavy pruning as compared with light pruning reduced yields materially.

Influence of cultivation on the growth and yield of blueberry plants, S. Johnston (*Michigan Sta. Quart. Bul., 19 (1937), No. 4, pp. 232–234, fig. 1*).—In the spring of 1935, certain Rubel blueberry plants grown since the establishment of the plantation under a system of clean cultivation, complete fertilizer, and cover crops after harvest were allowed to grow up to grass and weeds. Fertilizer treatments were continued, and the grass cover cut twice and allowed to remain where it fell. In 1936, a season characterized by a long drought, the 68 plants in sod yielded 53 qt., averaging 1,165 berries, as compared with 156 qt., averaging 873 berries, for a comparable number of tilled plants. Indications as to new growth pointed to similar results in 1937 and, on the whole, suggested that on sandy soils, such as used, cultivation should be employed through the harvest period with subsequent cover crops to maintain the organic matter.

Growing raspberries in West Virginia, H. E. Knowlton, W. H. Childs, and C. R. Orton (*West Virginia Sta. Circ. 72 (1937), pp. 24, figs. 12*).—Information of a general nature is offered on economic considerations, varieties, the establishment of plantations, propagation, pruning, soil management, fertilizers, harvesting, and diseases and their control.

Disposing of raspberry prunings by means of an ensilage cutter, H. A. Cardinell (*Michigan Sta. Quart. Bul., 19 (1937), No. 4, pp. 234–238, figs. 4*).—A description is presented of a method of disposing of raspberry prunings wherein the material is run through a silage cutter and returned to the soil as a source of organic matter. No evidence was seen that the prevalence of disease was in any way augmented by the application of prunings.

Blooming and ripening dates with yields of 167 varieties of grapes grown at Mountain Grove, Missouri, P. H. Shepard (*Missouri Fruit Sta. Circ. 27 (1937), pp. 8*).—This consists, for the most part, of tabulated data indicating that Dunkirk, Muench, and Hartford were the three most productive grape varieties, with estimated yields of 11,880, 11,520, and 11,340 lb. per acre, respectively.

Vegetative propagation of tropical and sub-tropical fruits, compiled by G. St. C. Feilden (*Imp. Bur. Fruit Prod. [East Malling, Kent], Tech. Commun. 7 (1936), pp. 67, figs. 12*).—Briefly describing the important methods of asexual propagation, the author presents specific information for a large number of fruits.

Propagating the avocado by means of stem cuttings, E. R. Eggers and F. F. Halma (*Calif. Avocado Assoc. Yearbook, 1936, pp. 63–66, figs. 3*).—A fair percentage of cuttings taken from 2-year-old Mexican nursery seedlings rooted successfully, but with the Fuerte and Nabal varieties failure resulted from attempts to root comparable material or to use marcottage.

Growth of the avocado tree in solution culture, A. R. C. Haas (*Calif. Avocado Assoc. Yearbook, 1936, pp. 66–69, fig. 1*).—Information is given on the solutions and methods employed in growing healthy avocado trees in nutrient cultures.

The effect of ringing on the carbohydrate and nitrogen content of Mexican avocado seedlings, R. Ticho (*Calif. Avocado Assoc. Yearbook, 1936, pp. 69–72*).—Dry weight was consistently lower in the roots and higher in the

tops of ringed than unringed trees. Root-top ratio calculated on both a fresh and dry weight basis was always higher in the unringed trees. Starch was higher in the tops of ringed trees, even that in the leaves being slightly but significantly greater. The effect of ringing on free and total reducing substances was rather slight, and that on total nitrogen was similar thereto.

Pectin in avocado leaves, A. R. C. Haas (*Calif. Avocado Assoc. Yearbook, 1936, pp. 72–74*).—A wide range was found in the percentage content of pectin in avocado leaves of different varieties. Leaves affected with tipburn had an apparently higher content of pectin than did healthy leaves of the same variety.

Chemical composition of avocado fruits, A. R. C. Haas (*Jour. Agr. Res. [U. S.], 54 (1937), No. 9, pp. 669–687, figs. 6*).—Following an earlier paper (E. S. R., 76, p. 43), in which it was shown that the number of stomata, the water loss, and the permeability of avocado fruits were greater toward the tip end, the author discusses, from the California Experiment Station, the composition of the different portions of fruits of several varieties. No consistent difference was observed between the fat content of the stem and tip halves of the pulp of avocado fruits. In the case of Fuerte avocados, the tip halves of the pulp usually contained on a fresh-weight basis slightly higher percentages of dry matter and of ash in the dry matter than did the stem portions. Potassium, the most abundant constituent of the ash, occurred in greater concentration in the tip portions. Both sodium and calcium occurred in only small amounts, but the direction of the calcium gradient in the pulp halves appeared to be opposite to that of potassium. The differences in iron content between the halves appeared to be statistically insignificant. Inorganic phosphate and also manganese decreased as the fruit matured. The percentages of total nitrogen were greater in the dry matter of the tip than of the stem half. Total sulfur and total chlorine on the percentage basis were greater in the stem than in the tip halves of the dry matter of the skin of avocado fruits, and the author suggests the possibility that chlorine may be involved in the break-down of the tissues of the skin of overripe fruits. Varieties showed considerable difference in their percentage composition of various combinations of materials.

The anatomy and histology of the bud-union in citrus, K. Mendel (*Palestine Jour. Bot. and Hort. Sci., 1 (1936), No. 2, pp. 13–46, figs. 7*).—The results are presented of examinations of samples of unions of the Shamouti orange budded on sweet lime and sour orange roots, collected at intervals from 1 day to 6 mo. after budding. The process of union formation could not be separated into a preliminary and a final stage but represented an apparently continuous process.

Phosphorus content of citrus and factors affecting it, A. R. C. Haas (*Soil Sci., 41 (1936), No. 4, pp. 239–257, pl. 1, figs. 3*).—Analyses by the Citrus Experiment Station, Riverside, Calif., of lemon fruits at all stages of development showed the highest percentage of phosphorus in the flowers. When tree-ripe fruits were eliminated, there was found a decrease in the percentage of P in the dry matter as maturity advanced. Lisbon lemons at comparable stages contained less P than Eureka lemons. The dry matter of the peel of lemons contained a higher percentage of P than did that of the peel of Valencia and Washington Navel oranges. Nitrate of soda fertilizer was found to result in an increased percentage of P in the peel and pulp of Valencia oranges and of lemons. P-free culture solutions permitted the growth of orange fruits but resulted in a marked reduction in the percentage of P in the dry matter of the peel.

Mottled citrus leaves in every case contained markedly higher percentages of P than did healthy leaves, and the leaves of trees receiving the largest applications of nitrogen contained the lowest percentages. This indicated that determinations of P in the leaves are not of themselves adequate for determining the needs of the leaves for phosphate. The percentages of inorganic P in citrus leaves exceeded in every case the organic and phospholipide fractions.

Potassium in citrus leaves and fruits, A. R. C. Haas (*Calif. Citrogr., 22 (1937), No. 4, pp. 154, 156, fig. 1*).—Data contributed by the Citrus Experiment Station at Riverside on the potassium content of the peel and pulp of orange and lemon fruits harvested from differential fertilizer plats suggest that differences in composition may be related to the potassium fertilization of the soil. On the whole, the peel of citrus fruits appeared to be the best index so far discovered in regard to potassium absorption as related to soil fertilization.

Developmental studies of the pineapple Ananas comosus (L) Merr.—I, Origin and growth of leaves and inflorescence, K. R. Kerns, J. L. Collins, and H. Kim (*New Phytol., 35 (1936), No. 4, pp. 305–317, pl. 1, figs. 6*).—The first visible evidence of an inflorescence is the increase in size of the meristem at the apex of the axis. The average period of time for completion of inflorescence formation and growth and the several divisions of these processes were determined. The inflorescence begins development before the peduncle starts elongation. The phyllotaxy of the large and small fruited varieties is noted. The time when the phyllotaxy changes from that of the leaf-producing to the inflorescence growing point is considered a critical one for the production of fruit and crown abnormalities.

Some effects of root-pruning on transplanted pecan trees, C. L. Smith and J. Hamilton (*Okla. Pecan Growers' Assoc. Proc., 1936, pp. 26–30*).—Based on observations the following January when dug, the cutting in early spring of 1934 of the taproots at 30 in. depth of Squirrel Delight pecan trees, the rootstocks of which were 5 yr. old and the tops 2 yr., resulted in an increased growth of the lateral roots and in most cases in the formation of new roots from the callus. Other trees with their taproots cut in autumn showed little or no callusing and some injury from termites and rots. Top growth the year following transplanting was greater in the spring root-pruned group than in either the autumn group or in unpruned controls. A repetition of the test in 1935 with Govette trees gave different results in that the spring root-pruned gave the poorest results as measured in subsequent top growth. In this case the greatest shoot growth was made by the trees root-pruned on August 29. Mortality was much higher in the unpruned controls than in any of the other groups. In the case of Schley trees in which all the laterals were cut off close to the taproot when transplanted, insignificant root growth occurred during the subsequent 2 yr. as compared with trees the laterals of which were unpruned. Top growth was proportionate to root growth. Some indication was observed that certain chemicals were highly effective in inducing root growth in root cuttings.

Morphological development of pecan buds, G. F. Gray (*Okla. Pecan Growers' Assoc. Proc., 1936, pp. 69–74, figs. 10*).—Stating that the pecan differs from the fruit trees in producing two different types of blossom buds, staminate and pistillate, the author discusses and depicts the several stages in the development of each type of bud. The pistillate buds are differentiated in late March or early April of the year they blossom, whereas the staminate flower buds are evident by microscopic examination 6 to 12 mo. prior to bloom.

Mint culture in northern Indiana, N. K. ELLIS (*Indiana Sta. Circ. 227 (1937), pp. 12, figs. 8*).—This pamphlet presents general information on varieties, propagation, culture, fertilizers, harvesting, distillation, and the control of pests.

[Floricultural investigations by the Ohio Station] (*Ohio Sta. Bul. 579 (1937), pp. 69–72*).—Among studies, brief reports upon which are presented, are photoperiodic effects on different flowering plants, including the chrysanthemum, gardenia, and aster, by G. H. Poesch and A. Laurie; control of chlorosis with iron salts, by L. C. Chadwick and Poesch; use of growth-promoting substances in propagation, by Poesch; effect of cloth tents on the growth of asters, roses, chrysanthemums, hydrangeas, and gardenias, by C. B. Link; and the effects of preheating gladiolus corms upon the time of flowering, by G. R. Mann and Laurie.

Old garden roses, E. A. BUNYARD (*London: Country Life, Ltd.; New York: Charles Scribner's Sons, 1936, pp. XII+163, pls.* [33]).—Historical, botanical, and other pertinent information is presented.

Hill's book of evergreens, L. L. KUMLIEN (*Dundee, Ill.: D. Hill Nursery Co., 1936, pp. XIV+304, [pls. 2], figs. [339]*).—Information is presented on the botany, propagation, pruning, culture, and utilization of narrow-leafed evergreens.

FORESTRY

[Forestry investigations at the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 393 (1937), pp. 188, 189, 190*).—General statements are presented with regard to activities in the propagation of forest nursery stock and its distribution, management of State forests, and the seasoning of maple posts.

[Forestry investigations conducted by the Ohio Station] (*Ohio Sta. Bul. 579 (1937), pp. 124–132, figs. 2*).—Included are brief reports on activities in the development of State forests and parks, reforestation activities, and species response to dangerously low winter temperatures, all by E. Secrest; the restocking of grazed woodlands, by R. R. Paton and Secrest; improvement cuttings and replantings in the State forests, by O. A. Alderman and F. S. Shulley; and forest fire control, by B. E. Leete.

Pot culture tests of forest soil fertility, H. L. MITCHELL (*Black Rock Forest Bul. 5 (1934), pp. XI+138, pls. 11, figs. 11*).—In these experiments Scots pine seedlings were grown under conditions of controlled radiation in sand and in sand plus raw humus, both supplied with basic nutrient cultures with only the nitrogen varied. In addition, white pine seedlings were grown in sand and in forest soils with various omissions of nitrogen, phosphorus, potassium, and calcium. Initial seed weight was found an important consideration requiring a mathematical correction.

The yields of Scots and white pine seedlings in sand were found to vary directly with the nitrogen concentration in the nutrient solution. Maximum growth was made at a nitrogen concentration of 300 p. p. m., and at this point the internal nitrogen concentration approximated 3.2 percent in both species. The proportion of root to shoot attained a maximum when the nitrogen content was 50 p. p. m. in the nutrient solution. The internal nitrogen supply is believed to be more important in determining yields than the external supply. Increases in radiation intensity from 50 percent to full light increased dry weights of Scots pine only when abundant nitrogen was present in the cultural medium.

Root growth in natural soils did not behave as in the sand, a fact thought associated with mycorrhizal development. In the different radiation treatments, it was observed that with less than 55 p. p. m. of nitrogen in the nutrient solu-

tion, increased radiation did not give increased growth. In the investigation of white pine in the four native soils, there was indicated a marked lack of phosphorus in all four soils, with some differences in the amount of available nitrogen. Seedlings grown without adequate nitrogen were yellowish, those with insufficient phosphorus were distinctly purple.

Studies on the development of conifers in raw humus.—III, The growth of Scots pine (Pinus silvestris L.) seedlings in pot cultures of different soils under varied radiation intensities, P. R. Gast (*Meddel. Statens Skogsförsöksanst.* [*Sweden*]. *No. 29* (*1937*), *pt. 7. pp. 587–682. figs. 22*).—Carried on partly in Sweden and partly at the Harvard Forest, Petersham, Mass., these experiments deal with the effects of simultaneously varied mineral nutrition and radiation on the growth of Scots pine and white pine seedlings growing in cultures of sand, sand and humus, and humus of high and low quality. Among conditions affecting the growth of seedlings was the weight of seeds, necessitating the use of a correction factor.

The level of radiation intensity was found to be of major importance in determining dry weight at intensities less than about 20 percent of that normally received in temperate, humid regions north of 40° latitude. With radiation intensities above 30 precent, nutrients became more important. Scots and Corsican pines were more responsive to nitrogen increments than was white pine. It was evident that at moderately high radiation intensities an increase in nitrogen availability can offset a deficiency in radiation. In fact, nitrogen supply may become the limiting factor to increased growth under conditions of abundant radiation. A radiation intensity of about 20 percent of full sunlight, equivalent to approximately 5–7 kg calories per square centimeter on a fixed horizontal surface through June, July, and August, is conceded the minimum supply from which Scots pine will develop a vigorous root system and a well-balanced top-root ratio. There was some indication that seedlings planted in a low-grade raw humus actually are drained of a part of their reserves.

The application of the findings to silvicultural management is discussed.

Increasing growth and yield of young spruce pulpwood stands by girdling hardwoods, M Westveld (*U. S. Dept. Agr. Circ. 431* (*1937*), *pp. 20, figs. 4*).—An experiment in girdling overtopping hardwoods in a mixed spruce-hardwood stand in central New Hampshire showed, 30 yr. after the initial treatment, a greatly increased volume of red spruce. There were 1,607, 974, and 172 cu. ft. of spruce per acre on the heavily girdled, moderately girdled, and no-treatment plats, respectively. Because of the heavy stand of spruce just below merchantable size on girdled areas, much larger increments are expected on these plats in succeeding years than on the check areas. The stand on the moderately girdled plats possessed, however, the greatest total volume of merchantable woods of both conifer and hardwood species.

From the viewpoint of profitable returns, it is estimated that in 1945, when the bulk of the spruce has attained merchantable size, the net gain in conifer pulpwood volume will be 23 and 13 cords per acre, respectively, on the heavily and lightly girdled plats, as compared with the controls. In conclusion the authors point out that selective girdling has been found effective in improving mixed spruce-hardwood stands, particularly in a region where hardwoods have market value. It is possible, wherever a satisfactory understory of conifers exists, to convert by girdling a mixed stand into a pure stand of conifers. A series of properly timed girdling operations has an advantage over single severe treatments because of decreased hazards caused by wind, sun, and frost.

Stumpage and log prices for the calendar year 1935, compiled by H. B. STEER (*U. S. Dept. Agr., Statis. Bul. 57 (1937), pp. 56, figs. 3*).—This is the usual statistical report (E. S. R., 75, p. 206) upon price levels and demands for stumpage and logs during the calendar year 1935.

DISEASES OF PLANTS

The Plant Disease Reporter, July 1 and 15, 1937 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 21 (1937), Nos. 12, pp. 221–235; 13, pp. 237–257, figs. 8*).—The following items of interest are included in these issues:

No. 12.—Relative prevalence and geographical distribution of various ear rot fungi in the 1936 corn crop, by P. E. Hoppe; reports on wheat stem rust from Virginia, Wisconsin, Iowa, and the Middle West; notes on *Cercosporella* foot rot and loose smut of wheat in Oregon and Washington, by R. Sprague; reports on wheat diseases in Massachusetts, anthracnose on rye in Wisconsin, mildew on barley in Iowa, and bacterial wilt on sweet corn on Long Island; survey of tobacco plant bed diseases in Florida, 1937, by R. R. Kincaid; tobacco plant bed diseases in western Kentucky, by E. M. Johnson; tobacco seedbed survey in Wisconsin, 1937, by J. Johnson; disease survey notes for Massachusetts, by O. C. Boyd; fruit disease situation in northern Virginia, by A. B. Groves; apple diseases in Wisconsin, by R. E. Vaughan; reports on pea mosaic on Long Island, root rot of peas in Wisconsin, cabbage diseases in New York, downy mildew on onion in Massachusetts, onion smut in New York, and clover anthracnose in Wisconsin; willow scab (*Fusicladium saliciperdum*) prevalent in Vermont, by H. L. Bailey; additional *Gymnosporangium* rusts in Maine, by F. H. Steinmetz and A. E. Prince; and tobacco downy mildew, found in Indiana by P. R. Miller and in Massachusetts by O. C. Boyd.

No. 13.—Preliminary data relating to the development of wheat stem rust in 1937, by E. C. Stakman; wheat stem rust in Kansas, by L. E. Melchers; wheat stem rust in North Dakota, by W. E. Brentzel; reports of damage to wheat from scab in Pennsylvania and Ohio; reports on bacterial wilt of sweet corn in Massachusetts and New York; other reports on cereal diseases, including smut on sweet corn in New York and barley scald found in Missouri; curly top appears in Utah tomato fields, by H. L. Blood; onion downy mildew situation in New York, by A. G. Newhall; other reports on onion downy mildew (Massachusetts and New York); potato late blight in New York, by H. S. Cunningham; reports on downy mildews of various crops; vegetable diseases reported from New York; summary of tobacco downy mildew in Virginia, Tennessee, Kentucky, and Indiana this year, by P. R. Miller; report of committee of the Tobacco Research Council on the black shank disease of tobacco; southern *Sclerotium* rot causing damage to sugar beets in Arizona, by J. G. Brown; spray injury to apples and peaches in Massachusetts and New York; fruit diseases in New York; some diseases reported on ornamentals; and *Cephalosporium* wilt (apparently new) of persimmon, by B. S. Crandall and R. W. Davidson.

[Plant disease work by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 393 (1937), pp. 173–181, 189*).—Reports of progress are included on virulence of chestnut blight (*Endothia parasitica*); further studies on late blight of potato and tomato; bordeaux mixture on potatoes; slip seeding of sweetpotatoes to avoid disease; sand culture of seedlings for control of damping-off; stimulation of muskmelons by sprays; yellows-resistant cabbage; "X" disease of peach; *Botrytis* rot on strawberries; spraying apples with fungicides; seed testing; plant disease survey, including notes on 142 diseases,

mostly fungus; the present status of work on the Dutch elm disease; and white pine blister rust control.

[Plant disease work at the Maryland Station] (*Maryland Sta. Rpt. 1936, p. XXXVI*).—Progress reports are included on strawberry root diseases and the life history of the peach stone fungus *Caryospora*.

[Plant disease work at the Nebraska Station] (*Nebraska Sta. Rpt. [1936], pp. 33, 34*).—Reports of progress are given relative to a survey of the 1935 cereal rust epidemic; the bacterial blights of beans; and a preliminary account of the potato disease known among growers as "hay wire."

[Plant disease work by the Ohio Station] (*Ohio Sta. Bul. 579 (1937), pp. 34–38, 39–42, 132*).—Progress reports are included on apple scab experiments, by H. C. Young; wetting agents for sulfur, sulfur toxicity, and steam vapor spraying, all by Young and H. F. Winter; raspberry anthracnose, by Winter; fasciation of sweet peas and other plants, and potato spraying experiments, both by P. E. Tilford; the effectiveness of various copper-containing spray materials in vegetable disease control, the effect of seedbed treatments on tomato transplants, and a test of copper fungicides, stickers, and spreaders on ginseng, all by J. D. Wilson and H. A. Runnels; the Dutch elm disease, and root rot disease of elms (cause unknown), both by Tilford; sick wheat, and bacteriophage inhibiting *Apl[anobacter* (=*Phytomonas*] *stewartii*, both by R. C. Thomas; freeing raspberry stock from gall, by Winter; further progress in the development of a new tomato variety resistant to leaf mold, and progress in the breeding of tomato varieties resistant to *Fusarium* wilt for greenhouse and canning industries, both by L. J. Alexander; and white pine blister rust control, by O. J. Dowd.

Disease relationships in grafted plants and chimaeras, T. E. T. Bond (*Biol. Rev. Cambridge Phil. Soc., 11 (1936), No. 2, pp. 269–285*).—From the studies reported it is concluded that the effects of grafting may be direct (owing to the transmission of causal agents or substances through the graft union), or indirect (due to a change in the normal responses to environal conditions). Negative results indicate that resistance and susceptibility are either genotypic properties of the protoplasm or are due to some factor not, as such, transmissible.

In artificially induced *Solanum* chimeras, tests with *Septoria lycopersici* indicated that the two components retain their characteristic reactions to infection unaltered.

Examples are given of the practical importance of grafting in the prevention and control of disease and mechanical injury in fruit and ornamental trees and shrubs. The importance of incompatibility between stock and scion is discussed, and examples are quoted in which grafting has led to the transmission of an unsuspected virus disease. The dangers from improper fitting and tying of the graft union are stressed.

The determination of physiological races of phytopathogenic fungi [trans. title], E. C. Stakman, M. N. Levine, J. J. Christensen, and K. Isenbeck (*Nova Acta Leopoldina, n. ser., 3 (1935), No. 13, pp. 281–336, pls. 5; abs. in Minnesota Sta. Rpt. 1936, p. 19*).—The paper summarizes the methods for determining physiologic races of some of the most important plant pathogens, particularly the smuts, rusts, and diseases caused by Fungi Imperfecti of cereals. Detailed keys for the determination of physiologic forms of the rusts and smuts are given.

Fungi associated with tree cankers in Iowa.—II, Diaporthe, Aploporthe, Pseudovalsa, and their related conidial stages, J. C. Gilman and G. L. McNew (*Iowa Acad. Sci. Proc., 42 (1935), p. 92*).—This abstract of a paper continuing the series (E. S. R., 75, p. 507) is a contribution from Iowa State College.

Eradication of citrus canker and control of phony peach and peach mosaic, B. M. Gaddis (*Jour. Econ. Ent., 29 (1936), No. 5, pp. 940–944*).—This progress report on phony peach control and citrus canker eradication covers the 18-mo. period beginning July 1, 1934, and on the peach mosaic survey and control for the period beginning in August 1935. "The activities of these projects are conducted in cooperation with the several affected States, which have rendered material financial and personnel assistance."

Aspergillus fischeri Wehmer, a fungus mildly parasitic on a number of plants, M. B. Harris (*Calif. Dept. Agr. Bul., 25 (1936), No. 3, pp. 378–383, figs. 2*).—As a result of the observations and experiments discussed, it is believed that *A. fischeri* can be classified as parasitic on some plants. It was found on bean, geranium, almond kernels, stem of tree peony, interior of caprifigs, heartwood of peach, almond, and apricot trees, roots of privet hedge, and twigs of Mayflower peach. Since no very extensive signs of disease were found on any plants except beans and geraniums, these hosts were the only ones experimentally studied.

Host plants of Cuscuta glomerata, H. L. Dean (*Iowa Acad. Sci. Proc., 42 (1935), pp. 45–47*).—In a previous paper[4] the author listed 83 host species for *C. gronovii*, to which 6 additional hosts have since been added. In the present contribution 54 host species (39 genera in 22 families) are listed for *C. glomerata*. Seven of these are woody plants while the remainder are herbaceous, including 2 sedges, 6 grasses, and 1 pteridophyte.

The tolerance of Erysiphe polygoni and certain other powdery mildews to low humidity, C. E. Yarwood (*Phytopathology, 26 (1936), No. 9, pp. 845–859*).—This paper reports studies conducted at Purdue University and the Universities of Wisconsin and California in cooperation with the U. S. D. A. Bureau of Plant Industry. On dry glass slides in Petri dishes with humidities controlled by graduated concentrations of sulfuric acid, conidia of *E. polygoni* from red clover and bean germinated well at 100 percent relative humidity and generally also at r. h. approaching 0, though here shriveling soon, especially at high temperatures. Several hours of predrying sometimes resulted in higher than normal germination at 100 percent r. h. The conidia of this species and of *E. graminis* shrank on germination, even at high r. h., while those of *Sclerotinia fructicola, Colletotrichum trifolii,* and *Cicinnobolus cesatii* swelled on germination in or on water but failed to germinate on dry slides at any r. h. Infection and mycelial development of the powdery mildews on various host plants tested was but little retarded by low atmospheric or soil moisture. Rain markedly checked the normal formation and dissemination of clover mildew conidia. Even high air humidity reduced their formation.

Viability and longevity of chlamydospores of Ustilago crameri, C. S. Wang (*Phytopathology, 26 (1936), No. 11, pp. 1086, 1087*).—In this study by the University of Minnesota the chlamydospores germinated even before morphologically mature. Some had retained their viability for at least 62 yr.

The ultracentrifugal study of virus proteins, R. W. G. Wyckoff (*Amer. Phil. Soc. Proc., 77 (1937), No. 4, pp. 455–462, pls. 3*).—"An air ultracentrifuge has been developed which is giving twofold help in the study of viruses. (1) Analytical runs with it, besides furnishing a measure of the size of the virus molecules, can tell whether a preparation is pure and what may be the molecular weight of its impurities, whether a virus consists of one molecular species or a family of related proteins, etc. (2) Runs in which large volumes are ultracentrifuged in fields sufficiently great to sediment any of the known viruses

[4] Rhodora, 36 (1934), No. 430, pp. 372–375.

provide the basis for a method of preparing pure virus proteins without having recourse to chemical treatment. This method opens up the way to the study of viruses which, unlike that of the tobacco-mosaic disease, are relatively unstable or present in only small amounts."

Fungicide adjustment: Preparation to meet requirements of disease and host, A. C. Sessions (*Indus. and Engin. Chem., 28 (1936), No. 3, pp. 287–290*).—This paper presents the results of work conducted mostly at the New Jersey Experiment Stations. A discussion is given of the factors involved in fungicide injury and in the problem of adjusting ammoniated copper silicate combinations to provide maximum fungicidal efficiency with minimum host damage, as determined by the effects on the spores of *Pestalotia* species and on peach and apple trees. The author indicates that these studies are being continued with other hosts to determine where the compromise between safety and fungicidal efficiency lies, in order that the copper silicate composition may be prepared which may meet these requirements.

Undescribed species of Cercosporella and Cercospora on certain grasses in Oregon and Washington, R. Sprague (*Mycologia, 29 (1937), No. 2, pp. 199–206, figs. 3*).—In this cooperative paper by the U. S. D. A. Bureau of Plant Industry and the Oregon and Washington Experiment Stations are described *Cercosporella holci* on *Holcus lanatus, C. subulata* on *Melica subulata*, and *Cercospora bromi* on *Bromus rigidus*, all new species and illustrated.

The susceptibility of certain wild grasses to Tilletia tritici and Tilletia levis, G. W. Fischer (*Phytopathology, 26 (1936), No. 9, pp. 876–886, figs. 3*).—Crested wheatgrass (*Agropyron cristatum*) affected in the field with bunt or stinking smut bore a smut ball in nearly every floret. Morphologically and pathogenically this smut proved similar to certain physiologic forms of *T. tritici*. Inoculations at the Washington Experiment Station resulted in 63.1 percent bunted heads on Hybrid 128, 8.53 percent on Turkey, and less on other winter varieties, with 65 percent on Hard Federation spring wheat. Inoculations revealed the susceptibility of *A. cristatum, A. pauciflorum*, and *A. subsecundum* to both *T. levis* and *T. tritici*, and *Hordeum nodosum* to *T. tritici*. These grasses were susceptible to the physiologic form of *T. tritici* from *A. cristatum*, as well as to others. Evidence of considerable varietal difference was found in the susceptibility of different selections of *A. pauciflorum* and of *A. cristatum* to *T. levis* and *T. tritici*.

Experiments on the chemical control of snow-mould of turf in Alberta, W. C. Broadfoot (*Sci. Agr., 16 (1936), No. 11, pp. 615–618; Fr. abs., p. 618*).—*Fusarium* sp., *Rhizoctonia* sp., and an unidentified basidiomycete were constantly associated with snow mold injury at Edmonton. Since isolates of each proved pathogenic at 6° C. to *Festuca rubra fallax*, it is concluded that any one or all three of these fungi, acting alone or together, may cause turf injury in Alberta.

Either calomel or mercuric chloride proved effective for control, provided not less than 4 oz. per 1,000 sq. ft. was applied. As much as 8 oz. caused no noticeable injury when the turf was lightly watered following application.

Fungus parasites of cereal rusts [trans. title], K. Hassebrauk (*Phytopath. Ztschr., 9 (1936), No. 5, pp. 513–516*).—Following mention of two previously known fungi parasitic on rusts, the author reports the definite identification of *Verticillium niveostratosum* and *Cephalosporium acremonium* as parasites of *Puccinia* spp. and several other rust parasites not yet definitely determined.

A method of inoculating seed barley with black loose smut for use in studies on physiologic races, V. F. Tapke (*Phytopathology, 27 (1937), No. 1, pp. 115, 116*).—A highly effective wet method of inoculating seed barley with the

black or seedling-infecting loose smut of barley (*Ustilago nigra*) is described. It was especially devised to eliminate the hazard of mixing smut collections, which is so troublesome in studies of physiologic races when the usual spore-dust method is used.

Echinulation of chlamydospores and the pathogenicity of a previously undescribed physiologic race of Sphacelotheca cruenta, H. A. RODENHISER (*Phytopathology, 27 (1937), No. 5, pp. 643–645*).—Observed under the oil-immersion objective, chlamydospores of *S. cruenta* appeared finely echinulated as compared with the smooth spores of *S. sorghi*. Evidence was obtained of segregation of factors governing the spore characters, type of sori, and color of the peridia. Chlamydospores from infected Johnson grass, collected in Arizona, had somewhat more prominent echinulations than any previously observed, and there is strong evidence that it represents a physiologic race pathogenically distinct from races 1 and 2 of Melchers (E. S. R., 70, p. 348). Pathogenicity tests indicated the susceptibility of kafir × feterita and the resistance of Pierce kaferita to this form.

Effect of leaf-hopper yellowing upon the carotene content of alfalfa, H. W. JOHNSON (*Phytopathology, 26 (1936), No. 11, pp. 1061–1063, fig. 1*).—From the determinations reported it would appear that leafhopper-yellowed alfalfa has about one-half the carotene content of green alfalfa and is, therefore, only about one-half as rich in potential vitamin A activity.

Bean mosaics: Their relations to the canning crop, O. A. REINKING (*Canner, 84 (1937), No. 17, p. 20*).—This contribution by the New York State Experiment Station briefly summarizes the present data on symptoms, hosts, and control of common and yellow bean mosaics and of a mosaic of Wisconsin Resistant Refugee bean which is possibly new. Since only the first named is particularly destructive to canning varieties of the Refugee type, the chief control studies by the station have been directed toward combating this disease, and some of the hybrids made between the mosaic-immune Robust pea bean and the Stringless Green Pod Refugee give promise of combining desirable canning qualities with resistance. Observations in the State indicate that Wisconsin Refugee may have a place with eastern canners for a short time but that Idaho Refugee will soon replace it.

Powdery mildew (Erysiphe polygoni) on garden snap beans, W. D. MOORE (*Phytopathology, 26 (1936), No. 12, pp. 1135–1144, figs. 2*).—This mildew is reported as widely distributed on snap beans and in recent years to have become of considerable economic importance throughout the Southeast. It is rarely found on the spring crop but appears each year on the fall crop, fungus development usually following light rains in late September and early October.

Although all known commercial varieties are susceptible, there is wide variation in this respect. Lists are given of those which undergo light, moderate, and severe infection.

Sulfur dusts or sprays gave good control, and sulfur-lime (75–25) proved the most economical and efficient of the materials tested.

The Fusarium yellows disease of celery (Apium graveolens L. var. dulce D. C.), R. NELSON, G. H. COONS, and L. C. COCHRAN (*Michigan Sta. Tech. Bul. 155 (1937), pp. 74, pls. 18*).—Since first observed in 1913, *Fusarium* yellows has been destructive in Michigan districts of intensive production and has been reported from most celery-producing States, where in some sections it has caused serious losses. Two forms, distinguishable by the symptoms produced in self-blanching varieties, were found generally in Michigan celery districts. A description of the first and differential characters of the second are given, and a California form differing from the two Michigan forms is noted. The

differential methods for forms 1 and 2 include color reactions on rice, aniline dye tests, reactions to copper salts, and morphology. Only minor morphological differences were noted, and it is suggested that the host relationship has a value equal to morphology for classifying the parasitic members of the section *Elegans*. Form 1 is made the type species *F. apii* n. sp., with form 2 a variety, *F. apii pallidum* n. v. The histological effects of the disease are those common to other fusarial wilt diseases, and besides vascular mycosis they include a pronounced tracheal gummosis and tracheal bacteriosis in field plants. The etiological relationship was proved by numerous successful inoculation tests, and each isolate induced a single form of the disease which was constant through repeated passages. The optimum for growth of *F. apii* was 28°–29° C. and for *F. apii pallidum* 26°–28°. Celery grew best at a soil temperature of 20°, and the disease was most active at 26°–30°. Observations indicated that dry soil is apparently unfavorable for yellows development, but the temperature and moisture relations are inseparable in the field. Thus if soils contain enough moisture for rapid growth they do not become hot enough to check growth, and optimum temperatures for development of the disease seldom occur.

Exclusion of the pathogen from noninfested soils is the first recommendation for control. Eradication tests (1914–15) proved the ineffectiveness of chemical treatments but demonstrated the effectiveness of steaming. Certain cultural practices as palliatives are recommended. A resistant strain of Golden Self-Blanching was developed from a 1919 selection and the Curly Leaf Easy-Blanching (a resistant green variety) from a selection of Newark Market. Michigan Golden, developed from the tall strain of Golden Self-Blanching, proved a very desirable, highly resistant type. Comparative tests (1933–34) of this with commercial yellow and green celeries are described.

Sterilization of corn grains with sodium hypochlorite, R. E. Girton (*Plant Physiol., 11 (1936), No. 3, pp. 635–639, figs. 4*).—In this contribution by Purdue University, "increasing the length of time of treatment of corn grains with sodium hypochlorite solution from 0.5 to 5 hr. reduced germination somewhat, whereas it greatly decreased the percentage of infected seed. When sterilization with the disinfecting solution for an intermediate period of time was accompanied by a suction injection treatment, there was a marked reduction in the number of infected grains."

Histological and cytological studies of ethyl mercury phosphate poisoning in corn seedlings, J. E. Sass (*Phytopathology, 27 (1937), No. 1, pp. 95–99, figs. 2*).—In ethyl mercury phosphate poisoning the leaf primordia became much thickened and developed irregular crenations and lobes, and in them and the apical meristem of the plumule cell division was inhibited and the existing cells underwent very great enlargement. Cells of the hypertrophied tissues became multinucleate, the nuclei ranging in size from minute "micronuclei" to very large "giant nuclei" (the latter polyploid). The multinucleate condition and the formation of micronuclei and giant nuclei are ascribed to the abnormal, incomplete mitosis.

Influence of "rust" on quality and yield of cotton and the relation of potash applications to control, J. H. Moore and W. H. Rankin (*North Carolina Sta. Bul. 308 (1937), pp. 18, figs. 8*).—"In recent years the condition known as cotton 'rust' has been responsible for severe damage to the quality and yield of cotton produced in the peanut area of the State. The usual fertilizer and cropping practice does not correct the condition. The application of additional quantities of potash has increased the yield and improved the quality of cotton grown on fields subject to rust damage. Results of these

and other experiments indicate that the problem may involve factors other than potash, and, therefore, further work is being planned to determine other causes and means of control."

Potash for cotton wilt in the Mississippi Delta region, L. E. MILES (*Better Crops With Plant Food, 20 (1936), No. 12, pp. 18–22, 41–44, figs. 2*).—In the rather heavy soils typical of the Yazoo-Mississippi Delta the wilt due to *Fusarium vasinfectum* is usually of minor importance, but local areas occur in which the soils are more favorable to the fungus. The situation in the Delta is further complicated by the presence of a second wilt due to *Verticillium dahliae*, which causes similar symptoms but is more common on the heavier soils.

The tests here reported as a contribution from the Mississippi Experiment Station were concerned with the *Fusarium* type of wilt, and the results were confirmatory of the benefits obtained in other parts of the State (E. S. R., 76, p. 201) by the application of adequate amounts of potash in connection with the use of cotton varieties of at least moderate resistance.

Pea seed treatment, K. J. KADOW (*Canning Trade, 59 (1937), No. 29, p. 19*).—As a result of trials by the Illinois Experiment Station, soil sterilization is recommended for the control of damping-off and seed treatment with copper or zinc preparations for other pea diseases.

How to apply red copper oxide and graphite to pea seed, J. G. HORSFALL (*Canner, 84 (1937), No. 18, pp. 13, 14*).—In this study by the New York State Experiment Station it was found necessary to polish the red copper oxide treated seed with graphite to insure proper drilling. To do this effectively and on a commercial scale a large drum of galvanized iron and a pea-washing reel provided with paddles were developed and are here described with full directions for use.

Some preliminary notes on the effect of psyllid yellows on seed stock from infected plants, C. H. METZGER (*Amer. Potato Jour., 13 (1936), No. 10, pp. 277–285*).—It is concluded from this study at Colorado State College that "sufficient evidence has already been presented to show that damage to seed from psyllid infestation may occur under certain environmental conditions, and that it is dangerous to certify fields showing more than 15 percent of mild symptoms of psyllid yellows on second inspection. This tolerance was adopted in Colorado beginning with the season of 1934."

Purple top disease linked with hair-sprout tubers, H. D. LONG (*Iowa State Hort. Soc. Rpt., 70 (1935), pp. 314–316, fig. 1*).—The author claims to have definitely linked purpletop with hair-sprout tubers, but the exact relation and cause of the trouble remain to be determined. Early strains of potato appeared to be less susceptible. The chief characteristics are described and illustrated.

Sclerotial formation in Rhizoctonia solani as affected by nutritional and other factors, W. B. ALLINGTON (*Phytopathology, 26 (1936), No. 9, pp. 831–844, fig. 1*).—The effect of certain nutritional factors, temperature, and H-ion concentration upon sclerotial development was studied at the University of Nebraska in cultures of a single isolate from potato. Sclerotia never formed before all the agar in the culture dish had been covered by the colony. Living potato tubers in culture dishes or soil appeared to afford nutrients necessary for sclerotia. Relatively low carbohydrate and high nitrogen favored sclerotia, which varied greatly in number and size with different nitrogen sources. Mycelial growth and sclerotium formation were best near pH 7.

Primary infection of Setaria italica (L.) Beauv. by Sclerospora graminicola (Sacc.) Schroeter, E. S. McDONOUGH (*Phytopathology, 27 (1937), No. 3, pp. 311–318, figs. 2*).—The germ tube produced by the oospore of *S. graminicola*

was found to penetrate directly into the epidermal cell of the *Setaria* seedling. The normal path of the mycelium is described as extending from the coleorhiza or primary root to the embryonic stem tip, from which it spreads to the young leaves and branches.

Effects of sulphur deficiency on the growth and metabolism of the soy bean, S. V. Eaton (*Ill. State Acad. Sci. Trans., 28 (1935), No. 2, p. 88*).—In the sulfur deficiency tests reported the chief symptoms were the yellow-green color of the leaves, the smaller leaflets, and the thinner stems. The tops were stunted more than the roots, and the upper leaves yellowed first. These symptoms are believed to be due both to the lack of sulfur and to the poor nitrate assimilation.

Notes on the present situation with regard to diseases of sugarcane in Puerto Rico [trans. title], J. H. Jensen (*Rev. Agr. Puerto Rico, 28 (1936), No. 1, pp. 89–94*).—In this contribution by the Puerto Rico Experiment Station, notes are presented on mosaic; gummosis; spot diseases due to *Leptosphaeria sacchari*, *Helminthosporium ocellum*, *H. stenospilum*, and *Phytomonas rubrilineans* [=*Bacterium rubrilineans*]; rots due to *Plasmodiophora vascularum* and *Colletotrichum falcatum;* the "pokkah boeng" disease due to *Fusarium moniliforme;* chlorotic stripe disease; manganese deficiency; and diseases not yet reported in Puerto Rico and methods for their exclusion.

A hypothesis to explain brown root-rot of Havana seed tobacco, A. B. Beaumont (*Science, 84 (1936), No. 2173, pp. 182, 183*).—As a result of work by the author (and his associates) while at the Massachusetts Experiment Station, it appears probable that the unoxidized forms of nitrogen resulting from the decomposition of organic matter are indirectly the cause of brown root rot. Because of its ephemeral and transitory character and its relation to the cropping system, it also appears that the unoxidized forms of nitrogen concerned originate from plant residues and possibly also from inorganic nitrogenous fertilizers supplied in large amounts in tobacco culture. Finally, it appears that the root rotting is due to the comparatively high concentrations of nitrogen in the roots, or a narrowed carbon-nitrogen ratio, caused by rapid absorption of basic nitrogen.

Some biochemical investigations on the crystalline tobacco-mosaic virus proteins, W. M. Stanley (*Amer. Phil. Soc. Proc., 77 (1937), No. 4, pp. 447–453, pl. 1*).—This abstract summarizes biochemical and serological studies of these virus proteins, with special reference to the author's own work and culminating in the following statement: "It is felt that the results fully justify the conclusion, for the present at least, that this unusual, high molecular weight protein is actually tobacco-mosaic virus."

Mosaic disease of tobacco: Action of proteoclastic enzymes on the virus fraction—nature of the virus fraction from various species of plants, A. F. Ross and C. G. Vinson (*Missouri Sta. Res. Bul 258 (1937), pp. 19*).—The data obtained indicated the virus inactivation by trypsin to be due to adsorption rather than to enzymic action on the host. Inactivation was greatest under conditions most favorable to adsorption. Pepsin inactivated the virus at pH 3, while comparable control preparations were not inactivated as shown by inoculation into *Nicotiana tabacum*. Pepsin inactivated the virus slowly, causing a gradual reduction in infectivity. Papain alone inactivated the virus to a marked degree, and when KCN was added as an activator complete inactivation was hastened. The virus was slowly inactivated by micro-organisms.

A method of purification is described that greatly reduces the ash content of the final preparations, which are believed to be as pure as or purer than any previously described. Purified preparations from several plant species all contained about 16 percent nitrogen and 1 percent ash (calculated on the total-

solids basis). The purified virus preparations from 19 plant species, varying widely in nature, all contained nitrogen, and its content was correlated with the infectivity. It is concluded that the virus is either a simple protein or is closely associated with simple proteins.

Tomato seed treatment, R. W. Samson (*Canning Age, 18 (1937), No. 5, p. 189*).—Studies by the Indiana Experiment Station indicate that with effective roguing and sorting processes, together with proper selection of seed fields in the first place, seeds internally infected with tomato pathogens are eliminated, and that scalding of the fruits and thorough washing of the seeds greatly reduces the surface load. For destruction of the organisms still remaining on the surface, with a fungicidal residue left for the prevention of recontamination, some of the organic mercurials were found to offer considerable promise. Ethyl mercury tartrate proved particularly effective in the tests reported, but the performance of the treated seeds under varied conditions must be determined before the method can be recommended for general use.

A spray program for greenhouse tomatoes, J. G. Horsfall (*Canner, 84 (1937), No. 16, pp. 9, 10, fig. 1*).—This contribution from the New York State Station outlines a program found successful in controlling diseases of greenhouse tomatoes, involving the dusting of seeds and spraying of the soil and plants with red copper oxide. On account of injury to the tender leaves of seedlings by the lime in bordeaux mixture and copper-lime dust, these preparations should not be used.

The treatment of glasshouse soils with chloropicrin for the control of Heterodera marioni (Cornu) Goodey, and other soil pathogens, W. Newton, J. E. Bosher, and R. J. Hastings (*Canad. Jour. Res., 15 (1937), No. 5, Sect. C, pp. 182–186*).—"Chloropicrin in 1-cc doses is lethal to bulb nematodes at 6 in. from the point of injection or within a soil volume of 1 cu. ft. It is also lethal to fungi. The vegetative stages are destroyed at 1:195,000 and certain sclerotia at 1:90,000. The injection of chloropicrin into greenhouse soils lowered the incidence and pathogenicity of a root knot infection on both a summer and winter crop of tomatoes and greatly increased the yields of fruit."

Turnip brown heart, R. R. Hurst and D. J. MacLeod (*Sci. Agr., 17 (1936), No. 4, pp. 209–214, figs. 4; Fr. abs., p. 214*).—Brown heart may occur in very small turnips but is most commonly found in roots greater than 2 in. in diameter. The symptoms are described.

"Tests conducted over a period of 3 yr. in the Maritime Provinces demonstrated that turnips require boron for normal development and further that the addition of this element to the land is a safeguard against brown heart. Finely powdered borax has been the most satisfactory source of boron for this purpose, 15 to 20 lb. per acre giving highly satisfactory control without causing injury to ordinary crops in subsequent rotations. Heavy liming of the soil predisposes the turnip to brown heart, while naturally alkaline soils render borax less effective. Proven methods of applying borax are as follows: In the drill, at the sides of the drills, broadcast, [and] combined with the fertilizer and dispersed by means of ordinary machine spreaders. The general inclusion of borax with commercial turnip fertilizer is not recommended at present."

Fruit and vegetable diseases on the Chicago market in 1936, G. B. Ramsey (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 1937, Sup. 101, pp. 81–96*).—Data are presented on the receipts by railroad and truck in the Chicago area, but the main space is devoted to notes on the diseases found affecting some 36 fruits and vegetables, listed alphabetically by common names.

The fungous flora of normal apples, G. A. Huber (*Wash. State Col., Res. Studies, 3 (1935), No. 1, pp. 26–28*).—This is an abstract of a dissertation from the State College of Washington, dealing with the sources of contamination and

spore load and with the fungi present and their relation to decay. Over 20 species of 14 genera, not previously reported on apples in the State, were obtained, and the following are demonstrated for the first time as capable of causing decay in apples: *Sporomia* sp., *Pyrenochaeta* sp., *Chaetomella* sp., *Aspergillus* sp., *Verticillium* sp. (forms 1, 2, and 3), and *Podosporiella* spp. (Nos. 1 and 2).

Physiological disorders of apples, H. Hill and M. B. Davis (*Sci. Agr.*, *17* (*1936*), *No. 4*, *pp. 199–208*, *figs. 12*; *Fr. abs.*, *p. 208*).—From observations and studies over a 5-yr. period, no correlation was established between the amount of root injury and the occurrence of cork or internal cork, corky core, and tree or bitter pit. The conditions found associated with these disorders were high carbonate lime soils; high percentage of nitrogen and organic matter, especially along with shallow-rooted trees brought about by compact subsoils; soil moisture excesses or deficiencies coupled with a high percentage of nitrogen and organic matter; and low available potash and a high phosphorus: potassium ratio, especially in the lower soil horizons.

Boron applications, fed as a nutrient solution to potted trees or injected into trees in the solid form in the orchard, gave evidence that this element exercises a control of these disorders.

Tree injections with boron and other materials as a control for drought spot and corky core of apple, H. R. McLarty (*Sci. Agr.*, *16* (*1936*), *No. 12*, *pp. 625–633*, *fig. 1*; *Fr. abs.*, *p. 633*).—From 1932 to 1935, 30 chemicals, alone and in various combinations, were tested. Significant controls of both troubles were obtained with boric acid and manganous borate, alone or in various combinations. When more than 0.48 g of BO_3 was used per 100 sq. cm of trunk cross-sectioned area no drought spot occurred in the next season's crop, and when more than 1.83 g were used there was no corky core. No foliage injury was noted with amounts of BO_3 up to 5.92 g, though slight injury occurred at the points of injection.

The connection between Dematophora necatrix and Rosellinia necatrix, H. N. Hansen, Harold E. Thomas, and H. Earl Thomas (*Hilgardia* [*California Sta.*], *10* (*1937*), *No. 14*, *pp. 559–565*, *pl. 1*).—Continuing the study of this fungus, previously found to be highly destructive to apple roots in the State (E. S. R., 72, p. 633), mature perithecia were developed on infected root samples held in damp chambers and identified as belonging to *R. necatrix*. "The germination of ascospores, with subsequent production in culture of the coremial stage and the demonstration of pathogenicity, are considered to constitute adequate proof of the genetic relation of *D. necatrix* to *R. necatrix*." A pycnidial fungus of the form genus *Phomopsis* and *R. aquila* (?) were found associated with the pathogen under study.

Rootstocks in relation to the black root rot (Xylaria mali) of apple trees, F. J. Schneiderhan (*Va. State Hort. Soc. Rpt.*, *41* (*1936*), *pp. 69–74*).—This contribution by the West Virginia Experiment Station briefly summarizes our knowledge on this disease and presents data on approximately 2,000 inoculations on 75 known rootstocks, 631 seedlings, and 46 species of forest trees. None of the rootstocks thus far tested proved immune.

Apple mosaic, H. Earl Thomas (*Hilgardia* [*California Sta.*], *10* (*1937*), *No. 14*, *pp. 579–588*, *figs. 3*).—An apple mosaic, found in California and apparently identical with the one known in the East, was transmitted by grafting to *Cotoneaster harroviana*, *Eriobotrya japonica* (loquat), *Photinia arbutifolia* (toyon), *Rosa* sp. (varieties Belle of Portugal and Independence Day), and *Sorbus pallescens*. Heating dormant apple shoots in several ways to near the killing point of apple tissues failed to inactivate the virus.

Some effects of the environment on the spongy dry rot of apples, S. Diachun (*Phytopathology*, 27 (1937), No. 2, pp. 203–206).—Observations on several varieties of apples artificially inoculated with *Colletotrichum fructus* indicated that spongy dry rot may resemble ordinary black rot when the formation of setose acervuli is inhibited by low atmospheric humidity. Leaves of apple seedlings artificially inoculated became infected at high atmospheric humidity, and abundant acervuli were formed.

Incidence and development of apple scab on fruit during the late summer and while in storage, C. O. Bratley (*U. S. Dept. Agr., Tech. Bul. 563* (1937), pp. 46, figs. 14).—Controversies regarding the responsibility for the apparent increase of scab in storage furnished the original instigation for this research. *Venturia inaequalis* was found to grow at 32° F., the usual storage temperature advised for apples. During early summer, enlargement of the lesions was similar to that of equal areas on the fruit, but later the lesion enlargement greatly outstripped that of the fruit. In commercial storage only a small percentage of old lesions enlarged, but the number of new lesions varied with the season and source of fruit, at times becoming commercially important. The greatest lesion enlargement occurred on fruit packed wet in tight boxes, while in open containers there was more shriveling and often a decrease in lesion size. More new lesions usually occurred on fruit from poorly sprayed, heavily infected trees, and on unsprayed fruit the number appeared to be correlated with the amount of foliage on the tree. A week's delay in storing produced no consistent effects. With constant relative humidity, greater enlargement of lesions occurred at 40° than at 32°, but fluctuations between these extremes were without apparent effect. With constant temperature, higher humidities promoted lesion enlargement. Small differences in temperature and humidity had little effect on the number of new lesions, but higher differences often induced an earlier development in storage. Lesions may appear at any time during storage. More lesions appeared on scabby than on clean fruit from the same tree. From spontaneous infection more new lesions appeared on the stem half of the fruit, though inoculation tests showed no such difference. Successful inoculations were equal on blush or green areas. No macroscopic differences indicating lesions which would later enlarge were observed, and generally there was no appreciable difference between lesions that had enlarged in storage and those that had not. Although usually darker, lesions appearing on McIntosh fruit during storage were often quite like orchard lesions: Similar lesions also occurred (1933) on Baldwin fruit.

Apples were successfully inoculated throughout their development and even after picking, but not at maturity if stored immediately thereafter. Scab did not spread from diseased to clean fruit, indicating that new lesions during storage result from infection on the tree. The length of the wet period necessary for fruit infection proved to be much longer than that reported for foliage and to increase as the fruit developed. The shortest latent period of infection observed on inoculated fruit was 23 days, and the longest 6½ mo. In bagging experiments over 3 yr. the latest spontaneous infection occurred about mid-August, and some of the resultant infection appeared after the fruit was stored.

Will heat and dry weather kill the apple scab fungus, H. W. Anderson (*Ill. Hort.*, 25 (1936), No. 4, p. [1]).—In this contribution by the University of Illinois, evidence is presented from two seasons with extreme droughts (1934, 1936), indicating the improbability that heat and drought can eradicate scab where it has become established in the spring. Observations emphasize the value of adequate spraying.

Non-parasitic disease of the apple in storage, H. H. PLAGGE, T. J. MANEY, and B. S. PICKETT (*Amer. Pomol. Soc. Proc., 51 (1935), pp. 181–192, figs. 2*).—This contribution by the Iowa Experiment Station comprises a general account summarizing the results of 12 yr. of study of types of break-down, scald, Jonathan spot, water core, brown heart, bitter pit, and other diseases sometimes confused (freezing injury, cork and drought spot, and internal browning), together with data on storage temperatures for apples.

Fusarium lateritium v. fructigenum in relation to wilt of China aster, R. S. RIKER (*Phytopathology, 26 (1936), No. 11, pp. 1085, 1086*).—In this note from the University of Wisconsin, the author questions the pathogenicity of this fungus for China-asters, as reported by Riker and Jones (E. S. R., 74, p. 60). Recent examinations of their strain suggest that it was a mixture with *F. conglutinans callistephi*, and that the infections were due to the latter.

A bacterial disease of Delphinium ajacis, B. O. DODGE (*Jour. N. Y. Bot. Gard., 36 (1935), No. 431, pp. 257–260, figs. 2*).—This is a preliminary note on a bacterial disease found very destructive to *D. ajacis* at The New York Botanical Garden, and which was apparently arrested by spraying with bordeaux mixture.

A bacterial leaf spot of Geranium, W. H. BURKHOLDER (*Phytopathology, 27 (1937), No. 4, pp. 554–560, fig. 1*).—A bacterial leaf spot of *G. sanguineum*, prevalent about Ithaca, N. Y., and apparently new, is described. The causal organism (*Phytomonas geranii* n. sp.) was isolated, its pathogenicity proved, and an extensive description is given. It is pathogenic also for *G. maculatum*, *G. pratense*, and *G. sylvaticum*. Infection was not obtained on *Pelargonium hortorum*. The fungus overwinters in lesions on the leaves of *G. sanguineum*.

The nematode disease of bulbous iris caused by Ditylenchus dipsaci (Kühn 1858) Filipjev 1936, and experiments on its control by bulb treatment, W. NEWTON, R. J. HASTINGS, and J. E. BOSHER (*Canad. Jour. Res., 15 (1937), No. 5, Sect. C, pp. 175–181, fig. 1*).—"The individual bulbs that arise from a nematode-infested mother bulb are seldom all infested, which is accounted for by the disappearance of the old bulb when the daughter bulbs form, necessitating a re-entrance. The nematodes appear to attack the stem and tunics first. Normally they enter the bulb proper through the base. Tip infection occurs, but is comparatively rare. No evidence has been obtained that nematodes enter the plants above soil level. Basal discoloration, as revealed by the removal of the dry caps from the bulb bases, is suggested as a diagnostic symptom in addition to the characteristic streaks in the outer fleshy scale and the discoloration at the base of the stems. Death and chlorosis of iris plants could not be attributed to bulb nematodes in infested plantations. No evidence was obtained that the bulb nematode significantly affects the forcing capabilities of iris bulbs.

"Immersion in water for 1 hr. at 44° C. killed iris bulbs when done early in November, with or without disinfectants. Treatments of iris bulbs with cold organic mercury solutions and other solutions increased the yield of bulbs, apparently because they controlled *Penicillium* sp. and other parasites rather than bulb nematodes. Fumigation with ethylene dichloride and ethyl acetate injured iris bulbs and failed to control the nematodes. Formalin as a fumigant was less injurious, but it was not effective as a nematocide."

Bacterial leaf spot of Primula, P. A. ARK and M. W. GARDNER (*Phytopathology, 26 (1936), No. 11, pp. 1050–1055, fig. 1*).—The bacterial leaf spot of *Primula* is characterized by brown spots with yellow borders on the older leaves. In this study by the University of California, *Phytomonas primulae* n. sp. was shown to be the cause and is described. Colonies on agar media be-

come green in color. The organism grows well at the low temperatures favorable to *Primula*.

Among 27 species and varieties inoculated, 21 proved susceptible. Spontaneous infection has been noted on 5 species, 1 of which was not included in the inoculation tests. In inoculation tests and in the garden only the older leaves proved susceptible.

Red copper oxide as a rose-spray, J. G. Horsfall (*Amer. Rose Ann., 1936, pp. 117–120*).—This contribution by the New York State Experiment Station reports progress in tests and general experience with this fungicide, including a list of rose varieties the leaves of which were injured by it. Its fungicidal properties are satisfactory, and attempts are being made to reduce its injuriousness.

Physiologic races of snapdragon rust, C. E. Yarwood (*Phytopathology, 27 (1937), No. 1, pp. 113–115, fig. 1*).—Two physiologic races of *Puccinia antirrhini* were distinguished by cross-inoculations on detached leaves. Race 1 attacks commercial, rust-susceptible snapdragons but not the recently developed rust-resistant strains. Race 2, found in five coastal districts of California, attacks severely all the susceptible and resistant varieties tested.

Balloons as indicators of insect drift and of Dutch elm disease spread, E. P. Felt (*Bartlett Res. Labs. Bul. 2 (1937), pp. 3–10, fig. 1*).—"These records in connection with the justified assumption that most of the diseased elms in the northeastern United States were infected by beetles which must have issued from or fed upon diseased trees warrant the belief that the somewhat distant spread of the trouble in the Northeast is due to wind drift. Incidentally, this in connection with the marked southeastward drift of balloons along the south shore of New England, suggests a reason for the relatively slow progress of the elm bark beetle toward a more eastern area extending out from Cambridge, Mass., where this insect has been known to occur from an earlier and independent introduction which was discovered about 1909."

A Verticillium root disease of American elm, L. R. Tehon and H. L. Jacobs (*Davey Inst. Tree Surg. [Kent, Ohio] Bul. 6 (1936), pp. 32, pls. 2, figs. 13*).—This disease is reported to have been known for some years prior to 1927 in the Ohio Valley and to have been especially destructive to shade trees in Cincinnati and Dayton. The symptoms are described, and the disease is shown to be due to *V. rhizophagum* n. sp. It is essentially a parasitization and destruction of the most recently formed xylem, of the cambium, and of the newest phloem. The host-parasite relations are discussed in detail. Attempted treatment on trees in the preliminary stages of the disease has thus far proved futile.

A bacterial gall disease of Douglas fir, Pseudotsuga taxifolia, H. N. Hansen and R. E. Smith (*Hilgardia [California Sta.], 10 (1937), No. 14, pp. 567–577, figs. 4*).—A gall disease of the twigs and stems of Douglas fir is described and shown to be due to *Bacterium pseudotsugae* n. sp. Actual contact of the pathogen with xylem elements appears essential for host infection, and *Chermes cooleyi* is suggested as the probable insect carrier. A species of hemlock, three of pine, and several herbaceous plants were inoculated, with negative results.

A new species of Chondropodium on Pseudotsuga taxifolia, W. L. White (*Mycologia, 28 (1936), No. 5, pp. 433–438, figs. 7*).—This study by Cornell University reports *C. pseudotsugae* n. sp. (illustrated and described) as causing a common but not serious disease of the outer cortex.

A leaf and twig disease of hemlock caused by a new species of Rosellinia, G. H. Hepting and R. W. Davidson (*Phytopathology, 27 (1937), No. 3, pp. 305–310, figs. 2*).—A disease causing local damage to hemlock in North Carolina was

shown to be due to *R. herpotrichioides* n. sp., which is fully described. The fungus occurs as a cobwebby to felty growth over twigs and leaf bases and results in death of affected parts. Perithecia are produced on this superficial mycelium.

The death of larch trees [trans. title], E. MÜNCH (*Forstwiss. Centbl., 58 (1936), Nos. 14, pp. 469–494, figs. 8; 16, pp. 537–562, figs. 4; 17, pp. 581–590*).—The history and literature of the larch disease are comprehensively reviewed (including the various causes to which it has been ascribed and a critique of previous theories), and the symptoms are described in detail. The author then gives a full discussion of his own comprehensive investigations and observations, including experiments relative to the influences of frost injuries, cankers, and the canker fungus *Peziza willkommii* [=*Dasyscypha calycina* or *D. willkommii*], the drying up of twigs and branches, lichens, the ascending character of the malady, and various other predisposing and aggravating causes (type of stand, insect injuries, leaf fungi, the recuperative powers of the trees under various conditions, soils, etc.).

It is concluded that the primary factors under German climatic conditions lie in the frost susceptibility of the opening buds and cambial growth in early spring, which allows the canker fungus to gain a foothold. Various other contributory factors enumerated also doubtless aid the fungus in assuming a parasitic or even epidemic role.

Larch canker, G. G. HAHN (*Natl. Shade Tree Conf. Proc., 12 (1936), pp. 120–127*).—The author reports a heavy infection of imported larch trees in Massachusetts (1927), identified as the true European larch canker and observed in the United States for the first time. Details are given regarding the susceptible species, the species reported as attacked in Europe and America, the world distribution, the source of the disease and its introduction into the United States, the economic importance and control of the disease in Europe, and the reason for attempted eradication in the United States.

The cultural characters and pathogenicity of the casual fungus *Dasyscypha willkommii* are compared with related forms. Only living healthy larch species were successfully infected by the larch canker fungus, whereas the related *D. calycina* and native forms were unable to infect larch under conditions of artificial inoculation.

The European larch canker and its relation to certain other cankers of conifers in the United States, G. G. HAHN and T. T. AYERS (*Jour. Forestry, 34 (1936), No. 10, pp. 898–908, figs. 4*).—An intensive search for this canker (*Dasyscypha willkommii*), discovered in 1927 on imported *Larix europaea* from Great Britain, has shown it confined to a small area in Massachusetts. The fungus is distinct from the imported saprophyte *D. calycina*, and infects only species of *Larix* and *Pseudolaryx*. Native species of the fungus genus on other hosts are discussed.

A general spread of this disease in the United States has apparently been averted by prompt action in the destruction of the original focus of infection, but new infections found in 1935 demonstrate that periodical reexaminations of the infested area are necessary to complete eradication.

Present knowledge on the disease is briefly reviewed, and a bibliography of 21 titles is included.

Blister-rust control: Manual for field men—Northeastern States, compiled by C. C. PERRY (*[Boston], 1936, 5. ed., rev., pp. [2]+82, [pls. 12]*).—This manual, prepared in cooperation with the U. S. D. A. Bureau of Entomology and Plant Quarantine, attempts to "touch briefly and simply upon the more important subjects that may be met with in connection with the field work" on white pine blister rust, with special reference to the Northeastern States.

The progress of blister rust in planted northern white pine, R. R. Hirt (*Jour. Forestry, 34 (1936), No. 5, pp. 506–511, fig. 1*).—Among 1,560 young trees of white pine (*Pinus strobus*) 3 yr. old from seed, planted in 1927 in an area at Warrensburg, N. Y., protected from subsequent infection by white pine blister rust (*Cronartium ribicola*) by maintenance of a *Ribes*-free condition, 244 were already infected when set out. Of these, 131 died in the next 8 yr., while 113 remained alive in 1935, 73 of which had outgrown all signs of rust. Of the 1,316 trees that were uninfected when set out, 199 had died, all from causes other than the rust. With the protection afforded by the absence of *Ribes* within 700 ft. of the planting, no new rust infections developed at any time, and the amount of aeciospore production was progressively reduced by the gradual death of the initially infected trees.

A method of separating the teliospores of Cronartium ribicola, R. K. Pierson (*Phytopathology, 26 (1936), No. 9, pp. 923–925, fig. 1*).—When fragments of leaves bearing the telia of *C. ribicola* were heated in 1–N nitric acid the telial columns were quickly detached and easily broken down by pressure on the cover glass into single teliospores, facilitating rapid counts.

Immunity of Viking red currant from white pine blister rust under field conditions, G. G. Hahn (*Phytopathology, 26 (1936), No. 9, pp. 860–875, figs. 2*).—The resistance (near immunity) of Viking currant (Syn. Rød Hollandsk Druerips) from eastern and western strains of *Cronartium ribicola* was shown for 973 bushes amply exposed for 3 yr. (1932–34) to natural infection in 28 plats distributed through blister rust areas in New England, New York, Oregon, and Ontario. Artificial inoculations of test plants with aeciospores of blister rust under favorable atmospheric conditions failed. These results, with others already reported (E. S. R., 73, p. 65), indicate a high resistance to North American and British strains of the rust, and confirm Norwegian observations. That resistance is a dominant character was evidenced by preliminary greenhouse tests.

Some results of investigations on Polyporus schweinitzii Fr., H. H. York, R. E. Wean, and T. W. Childs (*Science, 84 (1936), No. 2172, pp. 160, 161*).—*P. schweinitzii* was found causing serious root and butt rot in plantings of white pine (*Pinus strobus*) in western New York, but was not connected with a resinosis of this host most troublesome in soil with pH 6.0 or above in the same State.

Variability of Polyporus schweinitzii in culture, T. W. Childs (*Phytopathology, 27 (1937), No. 1, pp. 29–50, figs. 3*).—Fifty cultures of this fungus from various hosts and localities differed rather widely in appearance, growth rate, production of sporophores, reaction to acidity, and ability to attack wood. Differences also occurred between monosporous mycelia from basidiospores produced in pure cultures. Since no local or host-specialized strains were found, the serious damage by this fungus to planted white pine near Springwater, N. Y., is ascribed to site conditions rather than to any unusual virulence of the fungus. Comparable results reported for other fungi indicate that intraspecific variability should be given careful consideration in mycological research.

The Tympanis canker of red pine, J. R. Hansbrough (*Yale Univ. School Forestry Bul. 43 (1936), pp. IX+58, pls. 12, figs. 3*).—This doctoral dissertation discusses this recently found canker disease (E. S. R., 73, p. 502), damaging to *Pinus resinosa* but inconsequential on *P. strobus*, reported from Michigan, Ohio, New York, Connecticut, Rhode Island, Pennsylvania, New Jersey, Maryland, Massachusetts, and Maine and caused by a hitherto undescribed species

of *Tympanis*, previously referred to *T. pinastri*. The disease is described and illustrated. The parasitism of the fungus was demonstrated by inoculation tests. Infection was found to take place through dead laterals, spreading up to 3 ft. in a year. It was found only south of the optimum range for red pine and was more severe in pure stands than mixed and on poor sites than good, being favored by drought and poor vigor. Mixed planting, 8-ft. spacing, and judicious pruning and thinning are suggested to reduce infection.

The relation between penetration and decay in creosoted southern pine poles, R. H. Colley and C. H. Amadon (*Bell Tel. System, Tech. Pubs., Tel. Equip. Monog. B-937* [*1936*], *pp. 17, figs. 9*).—The detailed results of an increment borer study of over 3,000 creosoted southern pine poles standing for various periods up to 26 yr. in Florida, North and South Carolina, Tennessee, Virginia, Illinois, Wisconsin, Michigan, and New Jersey showed internal sapwood decay only in those instances where the creosote had failed to penetrate 75 percent of the thickness of the sapwood.

Intumescences on poplar leaves.—III, The role of plant growth hormones in their production, C. D. La Rue (*Amer. Jour. Bot., 23* (*1936*), *No. 8, pp. 520–524*).—Intumescences were produced on leaves of *Populus grandidentata* by applying pieces of already affected leaves, crushed intumescences, ether extracts of intumescence-bearing leaves, extract of *Rhizopus suinus*, and β-indolylacetic acid, suggesting that plant growth hormones may cause intumescences on leaves in unventilated damp chambers.

Diseases and pests of the rubber tree, A. Sharples (*London: Macmillan & Co., 1936, pp. XVII+480, pls.* [*5*], *figs.* [*80*]).—The three main parts of this compendium deal, respectively, with general remarks on plant diseases, structure, reproduction, and physiology of fungi; form and function; and diseases and pests. The bulk of the work under part 3 groups the subject matter under root diseases; tapping panel affections; stem diseases; leaf diseases; scorching and after-effects (and miscellaneous); insect, animal, and other pests; and treatment of diseases. A discussion of forestry methods of cultivation, a list of fungi recorded on rubber trees in Malaya, a glossary, and an index complete the book.

Cytospora canker of spruces, C. J. Gilgut (*Natl. Shade Tree Conf. Proc., 12* (*1936*), *pp. 113–118*).—In this contribution from the Massachusetts Experiment Station the author discusses the history, distribution, symptoms, and course of this disease, shown to be due to *C. kunzei*. It is primarily a bark disease proved by artificial inoculations to enter through wounds, but the effects of the fungus are too widespread and destructive for it to be considered a weak parasite. Once established, it slowly but surely destroys the lower limbs and finally kills the tree. It is considered the most serious disease affecting Colorado blue spruce and Norway spruce in the State.

Variation in Fomes igniarius (L.) Gill., A. F. Verrall (*Minnesota Sta. Tech. Bul. 117* (*1937*), *pp. 41, figs. 14*).—This fungus, causing heart rot of many hardwood species of trees, was chosen for the present study because of its wide geographical and host ranges and because the external appearance of the fruit body and the cultural characters were already known to vary somewhat. The fruit bodies used were collected during 1931–33 from one Colorado and eight Minnesota localities. The "tissue cultures" were made by transferring small pieces of the interior of the fruit bodies to agar slants. Single-spore cultures were made by the usual procedures.

It was found that the species apparently comprises three fairly distinct groups differing in sporophore morphology, growth rate, general appearance, production of methyl salicylate odor on artificial media, rate of rotting some

wood species, and in reaction to zinc chloride. The groups did not agree with taxonomic separation into typical *igniarius* and variety *nigricans*, but were correlated with host species. Each isolate differed in some major or minor respect, except for a few that appeared to (and may) have come from the same mycelium. The differences within the groups were both morphological and physiological, but the temperature relations of all isolates on malt agar appeared to be about the same. Haploid lines grew more slowly on artificial media and rotted wood much more slowly than did the dicaryotic isolates of the parent fruit bodies. Haploid lines from the same fruit body may vary in growth rate and general appearance. No sexual fusions between the three groups were observed. New dicaryons differing in growth rate from isolates of parent fruit bodies were produced by mating lines from related fruit bodies.

The effect of certain nitrogenous compounds on the rate of decay of wood, H. SCHMITZ and F. KAUFERT (*Amer. Jour. Bot., 23 (1936), No. 10, pp. 635–638*).—In this study at the University of Minnesota, varying amounts of asparagine and ammonium nitrate were supplied to cultures of sawdust of the heartwood and sapwood of Norway pine (*Pinus resinosa*) and paper birch (*Betula papyrifera*) and the rate of decay determined after inoculation with *Lenzites trabea* and *Polystictus versicolor*. Asparagine definitely increased the rate of decay of *Pinus resinosa* heartwood and sapwood by *L. trabea* and of *B. papyrifera* sapwood by *Polystictus versicolor* without affecting the rate of decay by the latter in birch heartwood. Except in one case where as much as 5 percent ammonium nitrate was added to *Pinus resinosa* heartwood, the addition of this material to both kinds of sapwood and heartwood failed to increase significantly the rate of decay. These results point to the probable importance of the amount and availability of organic nitrogen as a factor in determining the rate of wood decay.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Contributions on wildlife research] (*U. S. Dept. Agr., Bur. Biol. Survey, Wildlife Res. and Mangt. Leaflets BS–70 (1936), pp. 19; BS–71, pp. 6; BS–72, pp. 27; BS–73, pp. 4, fig. 1; BS–74, pp. [2], fig. 1; BS–75, pp. 2; BS–76, pp. 6; BS–77 (1937), pp. 32, pls. 2; BS–78, pp. 2; BS–79, pp. 4; BS–80, pp. [2]; BS–81, pp. 17, fig. 1; BS–82, pp. 8; BS–83, pp. 16; BS–84, pp. 9; BS–85, pp. 9, figs. 3; BS–86, pp. 4; BS–87, pp. 10; BS–88, pp. 10, pls. 4; BS–89, pp. 2; BS–90, pp. 5*).—Further contributions in this series (E. S. R., 76, p. 355) are as follows: Poisonous Snakes of the United States (BS–70); Wildlife in Land Planning, by W. L. McAtee (BS–71); Check-List of Marsh and Aquatic Plants of the United States, compiled by N. Hotchkiss (BS–72); Inheritance of "Woolly" in Rabbits, by A. W. Bellamy (BS–73); Nail Keg Nest Box, by G. S. Templeton (BS–74); Raising Otters in Captivity (BS–75); Some Suggestions for Bird Field Study, by M. T. Cooke (BS–76); The Wild Turkey on the Missouri Ozark Range—Preliminary Report, by H. L. Blakey (BS–77); Directions for Destroying House Mice (BS–78); Vent Diseases of Domestic Rabbits, by F. D. McKenney and J. E. Shillinger (BS–79); Feeding and Caring for Squirrels (BS–80); Suggestions for Combating Starling Roosts, by E. R. Kalmbach (BS–81); Mink Raising (BS–82); Birds in Relation to Fishes, by C. Cottam and F. M. Uhler (BS–83); Food of the Scaled Quail [*Callipepla squamata*]—Preliminary Report, by L. H. Kelso (BS–84); Self-Feeding System for Market Rabbits, by G. S. Templeton (BS–85); Sanitation in Domestic Rabbitries, by F. D. McKenney (BS–86); Some Accomplishments of the Cooperative Research Units—A Summary to January 31, 1937, by H. H. T. Jackson (BS–87); The Waterfowl Situation, 1936–37 (BS–88); and Infectious Myxomatosis of Domestic Rabbits

(Mosquito Disease, Big-Head Disease) (BS-89) and Hemorrhagic Septicemia of Domestic Rabbits (Contagious Nasal Catarrh (Snuffles), Subcutaneous Abscesses (Boils), and Other Forms) (BS-90), both by F. D. McKenney and J. E. Shillinger.

Wildlife Review, [April and July 1937] (*U. S. Dept. Agr., Bur. Biol. Survey, Wildlife Rev. Nos. 8 (1937), pp. 43; 9, pp. 40*).—A continuation of this series (E. S. R., 76, p. 651).

An animal census of two pastures and a meadow in northern New York, G. N. WOLCOTT (*Ecol. Monog., 7 (1937), No. 1, pp. 1-90*).—In this contribution, many of the details of which are given in tables, the author reports upon a census made of two pastures and a meadow near Barneveld, in Oneida County, N. Y. A total of 6,843 invertebrates were collected from 100 sq. ft. of grasslands on Merrimac fine sandy loam between April and October 1919. The contribution is presented with a list of 42 references to the literature.

Plants eaten by California mule deer on the Los Padres National Forest, C. S. ROBINSON (*Jour. Forestry, 35 (1937), No. 3, pp. 285-292*).—A list is given of plants eaten in California by *Odocoileus hemionus californicus*, compiled from notes taken during the period 1932-35 and covering every month in the year.

What can be done to keep deer out of the orchard, O. T. MCWHORTER (*Better Fruit, 28 (1933), No. 3, p. 8*).—In the course of a brief discussion of the methods of protecting tree and other fruits from injury by deer in Oregon, mention is made of the use of a carbide automatic flash gun which operates by dripping water upon calcium carbide. The gas generated causes a loud explosion with an accompanying beam of light, every few minutes. A single gun is said to protect 1,000 young orchard trees.

Winter activity of the skunk, W. J. HAMILTON, JR. (*Ecology, 18 (1937), No. 2, pp. 326, 327*).—A study of the hibernation of *Mephitis nigra* in central New York, conducted during the winters of 1931-32 and 1933-34, is briefly reported, tabular data being given on the relative activity of male and female skunks during that period. It was found that the females are confirmed hibernators, while the males are more or less active throughout the winter. Low temperatures seemed to be the inciting cause of winter sleep.

Activity and home range of the field mouse (Microtus pennsylvanicus pennsylvanicus (Ord.)), W. J. HAMILTON, JR. (*Ecology, 18 (1937), No. 2, pp. 255-263, figs. 2*).—The present contribution is said to be the result of a projected study designed to analyze the dynamics of cyclic phenomena in mammals. Voles were found to be more active by day than by night, the periods of greatest activity being shortly after dawn and in the hours preceding dusk. Predation possibly plays a selective part in determining periods of greatest activity, for less activity on the part of vertebrate enemies is apparent during the early morning and late afternoon. The home range of an individual vole seldom encompasses an area in excess of ⅟₁₅ acre.

The biology of microtine cycles, W. J. HAMILTON, JR. (*Jour. Agr. Res. [U. S.], 54 (1937), No. 10, pp. 779-790, figs. 2*).—Damage caused by field mice, particularly at the height of increase in their population, of which the annual loss caused by their destruction of fruit trees, hays, cereals, and garden truck has run into millions of dollars, led to the investigation by the [New York] Cornell Experiment Station here reported. The studies reported are based chiefly on field and laboratory observations of the common field mouse (*Microtus pennsylvanicus pennsylvanicus* (Ord.)) in the Ithaca, N. Y., locality. This species exhibits variable populations, being built up in 3 or 4 yr. from a low of 15 to 40 mice per acre after the periodic decline to from 60 to 250 per acre.

"Increased population is fostered by three reproductive factors: (1) An acceleration of the breeding rate; (2) an increased number of young per litter; and (3) the lengthening of the reproductive season, which allows for greater numbers of litters per year. Causes responsible for a decrease in numbers of mice may be abiotic, such as climatic influences, or biotic, such as diseases, predators, etc. It appears that murine epizootics occurring when mice have reached the peak of their abundance are the primary causative agent reducing mouse populations. Plagues of mice are often accompanied by disease of an epidemic nature among these animals.

"Forecasting the years of mouse abundance is important, for control methods may be inaugurated before the expected period of peak population, and the extent of the damage minimized." It is concluded that future peaks may readily be forecast, but increase in mouse populations occur rapidly, so that optimum densities may be reached in 2 or 3 yr. following the decline.

Check-list of birds of the world, III, J. L. Peters (*Cambridge: Harvard Univ. Press, 1937, vol. 3, pp. XIII+311*).—This third volume of the check list previously noted (E. S. R., 72, p. 356) takes up the orders Columbiformes and Psittaciformes, the literature being covered to the close of the year 1935. A new generic and seven new varietal names are proposed.

Life histories of North American birds of prey: Order Falconiformes (part 1), A. C. Bent (*U. S. Natl. Mus. Bul. 167 (1937), pp. VIII+409, pls. 102*).—This, the tenth of a series of bulletins on the life histories of North American birds (E. S. R., 68, p. 777), deals with the order Falconiformes, including vultures, kites, hawks, eagles, and American osprey.

Factors affecting yearly abundance of passerine birds, S. C. Kendeigh and S. P. Baldwin (*Ecol. Monog., 7 (1937), No. 1, pp. 91–123*).—A report of a study made of the factors affecting yearly fluctuations in abundance of a typical passerine bird, the house wren (*Troglodytes aedon* Vieil.), the study being made by a statistical method involving the use of coefficients of correlation.

Snow-killing of the bob-white, T. G. Scott (*Wilson Bul., 49 (1937), No. 1, pp. 21–27, figs. 3*).—Observations by the extension service and experiment station of the Iowa State College, the Iowa Conservation Commission, and the U. S. D. A. Bureau of Biological Survey cooperating, here reported, have shown that reasonably healthy bobwhites may perish through imprisonment by drifting snow, that exposure to cold, high winds, and snow may kill reasonably healthy individuals, and that cover subject to drifting is not ideal. It is pointed out that research into management practices should include work upon the effect and control of drifting snow.

Bird behavior as a result of emergence of seventeen year locusts, W. J. Howard (*Wilson Bul., 49 (1937), No. 1, pp. 43, 44*).—Observations of the feeding of the English sparrow, eastern robin, starling, bronzed grackle, eastern cowbird, and red-headed woodpecker on the periodical cicada near Indianapolis, Ind., are reported.

Food habits of adult pheasants in Michigan based on crop analysis method, P. L. Dalke (*Ecology, 18 (1937), No. 2, pp. 199–213, figs. 3*).—Data collected in the course of an investigation of the food habits of the pheasant from June 1930 to July 1, 1933, which centered in the general farming region of southern Michigan, are reported, the details being given in 11 tables and 3 graphs.

The introduced pheasant in Michigan is said to be a mixture of the Chinese ring-necked pheasant, the Caucasian pheasant or so-called English blackneck, and the green Japanese pheasant. It was found to be an omnivorous feeder, with the greatest variety of seeds and fruits eaten in October, when

106 plant species were represented. The high percentage of grain consumed by pheasants is not an indication of damage to grain crops, since most of it is waste, either from harvesting or planting or from manure spread on the fields. Corn, wheat, and barley comprise 83 percent of all the grain eaten. "In the pheasant territory of Michigan the most common wild seeds eaten were *ragweed, yellow foxtail, skunkcabbage, and green foxtail*. Ragweed accounted for 51 percent of all the seeds eaten. Wild fruits and nuts are eaten consistently, but their percentage is small (7.48), since the habitat of these species is restricted to a relatively small proportion of the pheasant range. Adult pheasants are not large consumers of insects and other invertebrates in comparison with plant food eaten. The common belief that grasshoppers are consumed in large quantities is not borne out by the investigation.

Iowa quail and pheasants in winter: *Severest winter in 117 years takes heavy toll*, W. E. Green and W. E. Breed (*Amer. Wildlife, 25 (1936), No. 6, pp. 83, 84, 90–92, figs. 4*).—A study of the effect of subzero weather and drifting snow on quail and pheasants during the winter of 1936 (the most severe in 117 yr.), conducted by the Iowa Experiment Station in the field, is reported. The pheasants were observed on a 3,840-acre area located in Winnebago County, northern Iowa, and the quail studies were made on 6,000 acres in Decatur and Wayne Counties in southern Iowa.

There was a loss of 250 of the 400 pheasants entering the winter on the observation area, of which 131 birds either froze or choked to death, or died from a combination of freezing and choking; 37 birds were found snowed under; 13 birds showed signs of pneumonia; 12 birds were illegally shot; only 1 pheasant showed evidence of starvation; and in only 1 case was it definitely certain that a bird had been taken by a predator. Of 218 quail lost during the winter of 1935–36, 160 died from cold and hunger, 51 were taken by raptors (largely Cooper's hawk), and 7 by foxes.

The high mortality that occurred was found to have been caused by the abnormally severe weather, food and cover on the area in the fall of 1935 having been sufficient to carry most of the birds through the winter under normal weather conditions. With pheasants, starvation and predation losses were negligible, the highest loss having been caused by freezing, choking, or a combination of the two. With quail, the agencies responsible for a high mortality were predators and the much more disastrous combination of hunger and cold. Even though predator loss was evident, it is probable that this high loss was related to the severe weather which weakened the birds and deprived the prey of much of their food supply and the predators of food other than quail.

A new fluke, Prosthogonimus folliculus n. sp. (Trematoda), from the American bittern, W. M. Reid and A. E. Freeman, Jr. (*Amer. Micros. Soc. Trans., 55 (1936), No. 3, pp. 366–368, fig. 1*).—Contributing from the Kansas Experiment Station, the authors describe a fluke removed from the cloaca of an American bittern (*Botaurus lentiginosus* (Montagu)) at Manhattan, Kans., under the name *P. folliculus* n. sp.

Occurrence of haematozoa in some California birds and mammals, F. D. and S. F. Wood (*Jour. Parasitol., 23 (1937), No. 2, pp. 197–201, figs. 12*).—The results of the examination for hematozoa of the blood of 208 birds, comprising 21 species, and of 185 mammals, including 18 species and subspecies, are reported.

Studies on the endoparasitic fauna of Trinidad mammals.—V, Further parasites from the ocelot, T. W. M. Cameron (*Canad. Jour. Res., 15 (1937), No. 1, Sect. D, pp. 24–27, figs. 2*).—In continuation of this series of studies (E. S. R.,

77, p. 213) several nematodes are recorded from the ocelot (*Felis pardalis*), and the whipworm *Trichocephalis serratus* is described in detail.

The effect of the winter of 1935–36 on Wisconsin quail, A. LEOPOLD (*Amer. Midland Nat., 18 (1937), No. 3, pp. 408–416, fig. 1*).—Data obtained in Wisconsin in the winter of 1935–36, which is thought to have wrought more destruction to bobwhite quail than any since the turn of the century (the mortality on measured samples having ranged from 30 to 83 percent), are given in tables and graphs. "The lethal effect is ascribed to 40 days of continuous cold and snow. The previous winter of 1934–35, as measured by a 'hardness test', was only 15 percent as severe; 1917–18, 72 percent. Fat, well-fed quail died in numbers, a phenomenon hitherto unrecorded. Some of these had ice under the wings. Many were imprisoned in snow. Attempts to develop a size index from body measurements, and an emaciation index from weight: length ratios, were unsuccessful."

A list is given of 12 references to the literature.

Protecting cherries from birds, H. A. CARDINELL (*Michigan Sta. Circ. 160 (1937), pp. 22, figs. 7*).—Presenting information on the tremendous losses caused by the depredation of birds, especially robins and starlings, the author describes and discusses a device that frightens birds by means of regularly timed explosions. This device, known as the automatic acetylene exploder and referred to on page 653 by McWhorter, was operated at moderate cost and at a great saving when considered in the light of the crop harvested. Robins, on the whole, were less frightened than the starlings, but there was no evidence in the 14- to 17-day period when protection seems necessary that any of the birds became accustomed to the explosions.

The parasites of pigeons in Canada, M. J. MILLER (*Canad. Jour. Res., 15 (1937), No. 4, Sect. D, pp. 91–103, figs. 17*).—A review of all the helminths found in the domestic pigeon and notes on their distribution, location in host, and pathogenicity are presented, togetner with a list of 35 references to the literature. A check list of the parasites of pigeons, systematically arranged, with their distribution throughout the world, is included. Four species of trematodes, namely, *Brachylaemus fuscatus*, *Echinostoma erraticum*, *E. exile*, and *E. parvum*, have been experimentally introduced into the domestic pigeon, as have three species of nematodes, namely, *Oxyspirura parvovum*, *Tetrameres (Microtetrameres) helix*, and *Trichinella spiralis*. Three helminths, *Ascaridia columbae*, *Capillaria columbae*, and *E. paraulum*, have been found in Canadian pigeons and are described, *E. paraulum* being recorded for the first time in North America. The lip characteristics of *A. columbae*, until now little studied, are described in detail.

An ecological study of parasites of some North Carolina salamanders, J. S. RANKIN (*Ecol. Monog., 7 (1937), No. 2, pp. 169–269, figs. 15*).—Following an introduction with references to the literature, an account of methods employed, and a summary of hosts examined, the ecology of the hosts examined, including their habitats and parasites of the hosts examined, and the ecology of parasites found, including parasitism and habitat, seasonal variation, host specificity, multiple infestation, size and age of host, and rare or accidental parasites, are considered. Parasite and host lists and keys to the parasites of North American salamanders are presented in two appendixes, and a bibliography of eight pages is included.

Studies on the heterophyid trematode Apophallus venustus (Ransom 1920) in Canada.—II, Life history and bionomics, T. W. M. CAMERON (*Canad. Jour. Res., 15 (1937), No. 2, Sect. D, pp. 38–51, pls. 3, figs. 8*).—In continuation of his studies (E. S. R., 76, p. 500), the author has found that the

eggs of this trematode pass into water, embryonate, and are swallowed by the snail *Goniobasis livescens*. They do not hatch in water. In the snail, multiplication through redia and daughter redia stages takes place and cercariae, with long flanged tails and pigmented eyespots, are produced. These escape into the water but have a free life of less than 48 hr. To survive during this period, they must penetrate the skin of a fish, a great variety of which are successful intermediaries. In the muscle of the fish the cercaria encysts to become metacercaria, which is however not immediately infective. Infection of the definitive host is by ingestion of the uncooked fish.

A catalog and host-index of the genus Leucocytozoon, G. R. Coatney (*Jour. Parasitol., 23 (1937), No. 2, pp. 202–212*).—A further contribution to the author's catalogs and host indexes of blood-inhabiting protozoa (E. S. R., 76, p. 244), in which 68 forms of the genus *Leucocytozoon* are listed in connection with a three-page list of references to the literature.

Taenia saginata: Its growth and propagation, W. J. and H. B. Penfold and M. Phillips (*Jour. Helminthol., 15 (1937), No. 1, pp. 41–48*).—This report of studies conducted in Melbourne, Australia, relates to the length and color, rate of growth, number of segments in a complete worm, length of life, and the number of eggs in a ripe segment of *T. saginata*.

Our insect friends and foes and spiders (*Washington, D. C.: Natl. Geogr. Soc., 1935, pp. [5]+252, [pls.] 66, [figs.] 159*).—The contributions by W. J. Showalter, J. I. Hambleton, W. M. Mann, J. E. Harris, H. E. Ewing, and L. Passmore here presented are accompanied by 64 pages reproducing over 500 insects and spiders and their habits in their natural colors by H. Murayama.

Some aspects of the role of water in insect hibernation, A. C. Hodson (*Ecol. Monog., 7 (1937), No. 2, pp. 271–315, figs. 8*).—Several aspects of the problem were studied during an investigation of the role of water in insect hibernation and are reported upon in this contribution from Minnesota. A three-page list of references to the literature is included.

Caustic potash preparations of insects and insect parts, W. A. Riley (*Amer. Micros. Soc. Trans., 55 (1936), No. 4, pp. 510–512*).—A description is given of a method of preparing whole mounts or parts of insects for study by the use of caustic potash, which has been found by the author to be the most satisfactory.

Some developments in economic entomology (*Indus. and Engin. Chem., News Ed., 15 (1937), No. 1, p. 4*).—A brief review is given of the advances during the year in knowledge as relates to the surgical maggot secretions, pyrethrum—derris and cube, ovicides, fumigants, the relation of optical activity of organic compounds on toxicity, and wetting and spreading agents.

[Report of work in entomology by the New Haven Station] (*Connecticut [New Haven] Sta. Bul. 393 (1937), pp. 181–187, 203, 204*).—The work of the year reported upon (E. S. R., 75, p. 373) relates to termites (E. S. R., 75, p. 376); European corn borer control; corn earworm; carpenter ants in telephone poles; use of insecticides in apple orchards; white apple leafhopper; substitutes for lead arsenate in orchard sprays; oriental fruit moth; gypsy moth suppression; European pine shoot moth control; mosquito control; Japanese beetle control; oriental beetle; and, at the Tobacco Substation, control of flea beetles on tobacco.

[Report of work with economic insects by the Nebraska Station] (*Nebraska Sta. Rpt. [1936], pp. 23–26*).—Work conducted during the year (E. S. R., 75, p. 224) with the chinch bug, hessian fly, alfalfa weevil, corn earworm, grasshoppers, potato flea beetle, potato psyllid, codling moth, and attraction of insects to light traps is referred to.

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[Report of work in economic entomology and zoology by the Ohio Station] (*Ohio Sta. Bul. 579 (1937), pp. 43–53*).—A report is made of the work of the year (E. S. R., 75, p. 374) with the annual white grub (*Ochrosidia villosa* Burm.) attacking lawns in Ohio, the gladiolus thrips, and the lacebug *Corythucha cydoniae* Fitch on *Cotoneaster*, all by C. R. Neiswander; European corn borer resistance, weedy corn and the southern corn rootworm, and seed corn protection from birds, all by L. L. Huber; oriental fruit moth (E. S. R., 75, p. 814) and strawberry leaf roller, both by R. B. Neiswander; apple flea weevil, by J. S. Houser and R. B. Neiswander (E. S. R., 75, p. 673); forest insect survey, by Houser and [J. B.] Polivka; codling moth, including experimental spray program, and the round-headed apple tree borer, both by C. R. Cutright; cotton aphid and cabbageworms (imported cabbageworm (E. S. R., 76, p. 830), cabbage looper, and diamondback moth), both by H. L. Gui; and the onion maggot influenced by weather, effect of different copper-lime ratios on the potato leafhopper (see p. 662), and variations in potato varieties to potato flea beetle attack, all by J. P. Sleesman.

Insect pest conditions forecast, J. R. Watson (*Fla. Grower, 45 (1937), No. 5, p. 25*).—A contribution from the Florida Experiment Station.

[Contributions on orchard insects and their control] (*Ill. State Hort. Soc. Trans., 70 (1936), pp. 251–259, 265–279, 431–456*).—The contributions on orchard insects here presented (E. S. R., 75, p. 808), mostly from the Illinois Experiment Station, are Oriental Fruit Moth Studies in 1936, by S. C. Chandler and W. P. Flint (pp. 251–259); Recent Developments in Codling Moth Control in the Pacific Northwest, by E. J. Newcomer (pp. 265–272); Results of Orchard Insect Control Experiments for 1936, by W. P. Flint and S. C. Chandler (pp. 274–279); Personal Experiences With Codling Moth Control Methods, by F. Heaton, O. G. Jones, F. Hawkins, and R. Byers (pp. 431–437); Three Years' Tests With Fixed Nicotines, by W. P. Flint (pp. 438–444); The Codling Moth Survey of 1936, by S. C. Chandler and W. P. Flint (pp. 445–454); and The San Jose Scale Survey of 1936, by S. C. Chandler (pp. 454–456).

Experiments in the control of orchard insects, 1936, C. R. Cutright (*Ohio State Hort. Soc. Proc., 70 (1937), pp. 48–57*).—This contribution from the Ohio Experiment Station refers to work in 1936 with the round-headed apple tree borer; field tests of new aphicides for the apple aphid; spray tests with new insecticides for the codling moth, apple maggot, apple aphid, European red mite, and plum curculio; sticker and spreader tests at Gypsum; and banding for the codling moth.

[Fruit pest control in the Northwest] (*Better Fruit, 31 (1937), Nos. 7, pp. 3–5, 7, 8, figs. 2; 8, pp. 3–5*).—Contributions presented in No. 7 include New Lead Arsenate Spray Combinations and How They Work, by J. Marshall and K. Groves (pp. 3, 4), contributed from the Washington Experiment Station; Phenothiazine, a Promising New Insecticide, by E. J. Newcomer (p. 5); Orchard Sanitation and Codling Moth Control, by A. D. Borden (p. 7); and Spraying Results [for the Codling Moth and San Jose Scale] in Idaho Prove Satisfactory, by W. H. Wicks (p. 8). Contributions in No. 8 include What Guide Should Be Employed in Choosing Spray Material, by L. Childs (pp. 3, 4), and The Spray Program for 1937, by R. L. Webster (p. 5).

Recommendations for codling moth and orchard mite control in Washington for 1937 (*Better Fruit, 31 (1937), No. 9, pp. 3–5*).—Recommendations for 1937 (E. S. R., 75, p. 375), prepared by the experiment station and extension service of the State College of Washington, the State department of agriculture, and the U. S. D. A. Bureau of Entomology and Plant Quarantine, are presented.

[Contributions on tree pests] (*Mass. Forest and Park Assoc., Tree Pest Leaflets 1 (1936), pp. [4], figs. 2; 2, pp. [4], figs. 2; 3, pp. [4], figs. 2; 4, pp. [4], fig. 1; 5, pp. [4], fig. 1; 6, pp. [4], figs. 3; 7, pp. 4, figs. 2; 8, pp. [4], fig. 1; 9, pp. [4], figs. 6*).—These practical contributions relate, respectively, to (1) The Eastern Spruce Gall Aphid *Adelges abietis* (L.), (2) The Birch Leaf Skeletonizer (*Bucculatrix canadensisella* Chambers), and (3) The European Pine Shoot Moth (*Rhyacionia buoliana* Schiff.), all by R. B. Friend, contributed from the Connecticut [New Haven] Experiment Station; (4) The Beech Scale (*Cryptococcus fagi* (Baer.) Dougl., by R. C. Brown; (5) Tent Caterpillars (*Malacosoma disstria* Hbn. and *Malacosoma americana* Fab.), by J. V. Schaffner, Jr.; (6) The European Spruce Sawfly *Diprion polytomum* Hartig and (7) The White-Pine Weevil (*Pissodes strobi* Peck), both by H. J. MacAloney; (8) The Sugar Maple Borer (*Glycobius speciosus* Say, also *Synanthedon acerni* (Sesia)), by H. I. Baldwin, H. J. MacAloney, and H. B. Peirson; and (9) The Elm Leaf Beetle (*Galerucella xanthomelaena* (Schrank)), by P. A. Readio.

Fabric insects: How to combat them in the home, W. P. Flint and W. E. McCauley (*Illinois Sta. Circ. 473 (1937), pp. 12, figs. 3*).—A practical account of the carpet beetles, clothes moths, and the cigarette beetle, methods of preventing injury, and ways of destroying such fabric insects.

Insect transmission of virus diseases of plants, M. T. Cook (*Sci. Mo., 44 (1937), No. 2, pp. 174–177*).—A brief practical discussion of the role of insects in the transmission of virus diseases of plants contributed from the Puerto Rico College Experiment Station.

Insects pollinating onions, F. R. Shaw and A. I. Bourne (*Amer. Bee Jour., 76 (1936), No. 8, pp. 401, 402*).—The data here contributed from the Massachusetts Experiment Station have been noted from another source (E. S. R., 74, p. 228).

A review of some recent experimental work with derris and pyrethrum, J. P. Barrett (*Canad. Ent., 69 (1937), No. 4, pp. 73–77*).—A brief review is given of some of the newer developments in the use of derris and pyrethrum.

The adsorption-absorption and translocation of derris constituents in bean plants, R. A. Fulton and H. C. Mason (*Science, 85 (1937), No. 2202, p. 264*).—The data thus far obtained indicate that derris constituents of insecticides when applied as suspensions in water to bean plants are adsorbed-absorbed and translocated to new growth of such plants.

Magnesium sulfate: A new insecticide, H. W. and M. S. Frings (*Science, 85 (1937), No. 2209, p. 428*).—Brief reference is made to tests of grasshoppers, which indicate that magnesium sulfate may be of insecticidal value in the control of mandibulate insects.

Nicotine peat: A new insoluble nicotine insecticide, L. N. Markwood (*Indus. and Engin. Chem., 28 (1936), No. 5, pp. 561–563, figs. 4*).—A water-insoluble insecticide was prepared by the reaction of nicotine and peat in aqueous solution. "A study of the factors involved showed that the nicotine content of the product is not greatly affected by the concentration of nicotine, the degree of dilution, or the ratio of peat to nicotine. The coarser particles of peat are combined with more nicotine than the finer ones. The presence of acid in the reaction reduces the nicotine content of the product. Peats vary in their capacity for holding nicotine. The highly acid peats combine with a greater amount of nicotine than the less acid or neutral peats. When peat is first treated with acids to remove inorganic basic constituents (calcium, magnesium, iron, aluminum, etc.), the nicotine content is increased and the proportion of soluble nicotine is reduced. The peats that are benefited most by the acid treatment are those of least natural acidity."

A new water-soluble nicotine insecticide—nicotine humate, L. N. Markwood (*Indus. and Engin. Chem., 28 (1936), No. 6, pp. 648, 649, fig. 1*).—In continuation of the above work, the author has found that "the liquid separated from nicotine peat also contains nicotine, not as the free base, but in combination with humic acid derived from the peat. This aqueous solution can be treated with alkali and the nicotine recovered by distillation, but since the compound in solution, nicotine humate, may have a usefulness of its own, it has been recovered unchanged by evaporating the water. Nicotine peat and nicotine humate are thus companion products formed in a single reaction. Nicotine humate is a black product, soluble in water, forming what is undoubtedly a colloidal solution." This is a stable product giving a clear solution in water, with from 28 to 34 percent of nicotine, depending on the type of peat from which it is made. "This yield is a function of the type of peat and its preliminary treatment and the ratio of peat to nicotine. The product has insecticidal possibilities similar to those of commercial nicotine sulfate."

Oil sprays: Chemical properties of petroleum oil unsaturates causing injury to foliage, R. P. Tucker (*Indus. and Engin. Chem., 28 (1936), No. 4, pp. 458–461*).—Experimental evidence is said to indicate that the unsaturated hydrocarbons of the lubricating fractions of petroleum oils are not toxic to foliage until they are oxidized to asphaltogenic acids. "At ordinary temperatures this oxidation takes place to a measurable degree only in the presence of air and light. Using apricot leaves as a testing medium, it was found that the toxic threshold is reached when approximately 0.5 percent of asphaltogenic acids are formed. The relation of viscosity and percentage of unsaturates present in a spray oil to its susceptibility to oxidation in light of various intensities is discussed."

The effect of soap sprays on plants, J. M. Ginsburg and C. Kent (*Jour. N. Y. Ent. Soc., 45 (1937), No. 1, pp. 109–113*).—In work by the New Jersey Experiment Stations greenhouse, garden, ornamental, and orchard plants were sprayed with various concentrations of coconut oil soap in order to determine the maximum concentration that can be applied without injury. Concentrations of 0.25 percent of soap caused no injury to blossoms or foliage of any one of the plants tested: 0.5 percent produced no injury to foliage, stems, or buds but caused injury to delicate flowers; 1 percent, no injury to orchard trees but injured many greenhouse and garden plants; and 2 percent, injury to most of the plants tested.

W. S. C. "Dynamite" spray: How to mix and use it, J. Marshall and K. Groves (*Better Fruit, 31 (1937), No. 10, pp. 3, 4*).—A practical contribution from the Washington Experiment Station, a reference to which by Webster has been noted (E. S. R., 76, p. 830).

The relative toxicity of insect fumigants, H. H. Shepard, D. L. Lindgren, and E. L. Thomas (*Minnesota Sta. Tech. Bul. 120 (1937), pp. 23, figs. 4*).—The relative toxicity of most of the insect fumigants in commercial use is reported for the confused flour beetle, the granary weevil, and the rice weevil. Following a description of the method of determination of fumigant toxicity, the relative toxicity of fumigants to various insects, the toxicity of new compounds as insect fumigants, the relative susceptibility of different species to fumigants, the relation of toxicity to temperature, and fumigant penetration are dealt with, the details being given in tables and graphs.

"Some new compounds of high toxicity were investigated, as well as a number of chlorinated compounds closely related to those in common use. The latter arrange themselves in an orderly manner with respect to their relative toxicity and their chemical constitution. Methyl thiocyanate has noteworthy

toxicity greater than that for chloropicrin and approaching that for hydrocyanic acid. An apparent correlation of developmental temperatures and susceptibility to fumigants is pointed out in the case of some closely related insect species. The lower the temperature the less effective is a fumigant, to a certain point. Below about 10° C. (50° F.) the fumigant, however, becomes more effective the lower the temperature. This effect seems to be caused by the interaction of sublethal low temperature and low concentrations of the fumigant.

"The role of adsorption in the fumigation of stored goods, as well as their penetration by the fumigant, has been discussed. The relative importance of adsorption in fumigant problems is indicated by the results of preliminary experiments."

A list of 39 references to the literature is included.

Tables for rapid calculation of spray and dust requirements, R. L. McMunn (*Ill. Hort., 26 (1937), No. 2, pp. [4–7]*).—Tables are given showing the rate of application, correction factors, and amounts of spray per tree; calculation of spray materials required when the dilution is made in pounds or gallons per 100 gal. of water; correction factors for lime-sulfur of different strengths and the gallons and pints of lime-sulfur of different strengths to use in making up 100 gal. of spray and for calculating nicotine sulfate (40 percent only) requirements; equivalent amounts in pints, ounces, grams, and cubic centimeters of nicotine sulfate for different dilutions; calculation of pounds needed in making dust mixtures; and correction factors for varying rates of dust applications.

The nasute termites of the Philippines, S. F. Light and F. J. Wilson (*Philippine Jour. Sci., 60 (1936), No. 4, pp. 461–520, figs. 26*).—Sixteen new species are here described, making a total of 49 species of termites known to occur in the Philippines.

An ecological study of some Orthoptera of the Chicago area, H. F. Strohecker (*Ecology, 18 (1937), No. 2, pp. 231–250, fig. 1*).—This contribution includes a review of the literature, presented with a list of 33 references.

Controlling grasshoppers in orange groves, J. R. Watson (*Citrus Indus., 17 (1936), No. 11, p. 16*).—A practical contribution from the Florida Experiment Station.

Studies on the embryology of the African migratory locust Locusta migratoria migratorioides Reiche and Frm., I, II, M. L. Roonwal (*Roy. Soc. London Phil. Trans., Ser. B, 226 (1936), No. 538, pp. 391–421, pls. 3, figs. 16; 227 (1937), No. 543, pp. 175–244, pls. 7, figs. 15*).—Part 1 of this contribution deals with the early development, with a new theory of multiphased gastrulation among insects; part 2 with organogeny.

On some Thysanoptera from American conifers, J. D. Hood (*Ent. News, 48 (1937), No. 3, pp. 74–80, fig. 1*).—*Taeniothrips pini* (Uzel), a European species which feeds upon pine, spruce, and fir, is recorded from several islands in Lake Superior near Grand Portage, Minn., feeding on young needles of black spruce (*Picea mariana*), and on the same host in Canada across the Pigeon River from Minnesota. *Oxythrips coloradensis*, in flowers of *Pinus scopulorum* at Boulder, Colo., and *O. pinicola*, in the flowers of *P. edulis* near Fraser, Colo., and on *Ribes cereum* growing among pines in Crater Lake National Park, Oreg., are described as new.

Notes on the distribution and hosts of some western Thysanoptera, S. F. Bailey (*Ent. News, 48 (1937), No. 2, pp. 43–49*).—Notes are presented on 44 forms which supplement the account previously noted (E. S. R., 75, p. 377).

Thysanoptera of Formosa, R. Takahashi (*Philippine Jour. Sci., 60 (1936), No. 4, pp. 427–459, figs. 4*).—An attempt has been made to list all of the species

of Thysanoptera known to occur in (Taiwan) Formosa, with brief biological notes on some of the forms. Two species and a variety are described as new.

Say's grain bug (Chlorochroa sayi Stal.) in Canada, L. A. Jacobson (*Canad. Ent., 68 (1936), No. 11, pp. 259, 260*).—Say's stinkbug, an outbreak of which in New Mexico in 1915–16 was studied by Caffrey and Barber (E. S. R., 41, p. 355), made its initial appearance in Alberta in appreciable numbers in 1935 and is now present in all districts of southern Alberta where grains are grown. At the present time the only recommended control measure consists in the early spring burning of weeds and rubbish under which the adults pass the winter.

The potato leafhopper, J. P. Sleesman (*Ohio Veg. Growers Assoc. Proc., 22 (1937), pp. 69–75*).—This contribution from the Ohio Experiment Station reports briefly upon the biology of the potato leafhopper, its injury to potato, relative number on potato varieties, and control. It is based upon experimental work in 1934, 1935, and 1936, the results of which are given in tables.

In the control work with bordeaux mixture, copper-lime dust, and dusting sulfur, a fine dusting sulfur was found equally as effective as 4–6–50 bordeaux mixture in restricting the leafhopper population, but the vines did not remain green as long and the injury was slightly less when sulfur was used. Dusting with freshly mixed 20–80 copper-lime dust was as satisfactory as spraying with a 4–6–50 bordeaux mixture only when the dusting was done at a time when the plants were wet with dew. Significantly higher yields were obtained when the lime content of the bordeaux mixture was reduced to one-half that of the copper sulfate, that is, a copper sulfate-lime ratio of 2 to 1. Population counts indicated that the number of nymphs does not vary significantly for the different bordeaux treatments, and that the differences in yield cannot be attributed to differences in leafhopper populations. There is strong evidence that copper in some manner exerts a stimulative action upon plant growth in addition to protecting the foliage against attack by insects and diseases.

Notes on the oviposition and life-history of the leafhopper Oncometopia undata Fabr. (Homoptera: Cicadellidae), R. B. Swain (*Ent. News, 47 (1936), No. 10, pp. 264–266*).—A résumé of life history studies of *O. undata* conducted at the U. S. D. A. Bureau of Entomology field laboratory at Webster Groves, Mo., in 1933 is presented.

Philippine Cicadellidae (Homoptera), G. Merino (*Philippine Jour. Sci., 61 (1936), No. 3, pp. 307–400, pls. 4*).—In this contribution the author has described or determined 83 species of Cicadellidae, 35 of which are new and 14 recorded from the Philippine Islands for the first time. Three genera (*Roxasella*, *Omanella*, and *Alituralis*) are erected. A check list of the Philippine forms with the original bibliography and synonymy is included.

A study of potato psyllid yellows in Wyoming, G. Hartman (*Wyoming Sta. Bul. 220 (1937), pp. 40, figs. 6*).—Tests and observations made during the last two seasons for the control of the potato or tomato psyllid *Paratrioza cockerelli* Sulc. and potato psyllid yellows are reported upon, the details being given in seven tables. It is concluded that the winter home of this insect is local, the insects increasing to numbers sufficient to produce damaging infestations in potato fields by the latter part of June or the first part of July, and the severity of the infestation depending upon the temperature conditions. Potatoes in the field appear to be damaged but little, if any, by potato psyllids until they have reached the budding or early blooming stage of growth. Potato fields planted June 1 appear to be damaged to a less extent than fields planted before that time.

"Lime-sulfur is an effective control for the damage to yields of potatoes caused by the potato psyllid. Pressure of from 300 to 400 lb. per square inch should be used in applying the spray. Three sprays should be applied per season in early planted fields, while two applications seem to be sufficient in late planted fields. Spraying potato vines before the first flower buds appear does not seem to benefit the potato plants and may result in injury. Spraying potato fields when psyllid nymphs are not present upon the vines gave no beneficial results in 1936 when yields were used as a measure. Where psyllid nymphs were present upon the potato vines, spraying with lime-sulfur spray increased the yield and improved the quality of the tubers harvested.

"There is not, at present, any known method of forecasting the extent of psyllid infestation before the first of July each year. There is no indication that the symptoms produced upon potatoes by the action of psyllids is carried from one season into the next by tubers from affected plants. The symptoms are produced only after psyllid nymphs have been present upon the vine. A few standard varieties appear to be partially resistant to the effects of the psyllid. These varieties may be used by the small grower for home consumption but are not to be recommended at the present time for the commercial potato grower in Wyoming."

The control of aphids on apples in Virginia, W. S. Hough (*N. J. State Hort. Soc. News, 18 (1937), No. 2, pp. 891, 892*).—A practical contribution from the Virginia Experiment Station.

Control of the rosy and green apple aphids in Ohio, C. R. Cutright (*Ohio State Hort. Soc. Proc., 70 (1937), pp. 166, 168, 170, 171*).—A practical contribution on the rosy apple aphid and the apple aphid from the Ohio Experiment Station.

Warble fly control in Canada, A. Gibson and C. R. Twinn (*Sci. Agr., 17 (1936), No. 4, pp. 179–198; Fr. abs., p. 198*).—Studies of warble flies (the common cattle grub and the northern cattle grub) and their control, conducted in western Canada at Indian Head, Sask., and at Kamloops and near Salmon Arm, B. C., and in eastern Canada in the Provinces of Ontario and Quebec, are reported upon, the details being given in tables.

The larval stages of *Wohlfahrtia vigil* (Walker), E. M. Walker (*Jour. Parasitol., 23 (1937), No. 2, pp. 163–174, figs. 24*).—A description is given of the three larval stages of this sarcophagid flesh fly.

On the biology of the black scale *Chrysomphalus aonidum* L. in the Jordan Valley, H. Z. Klein (*Hadar, 10 (1937), No. 1, pp. 3, 4, 6–8, figs. 4*).—A study of the Florida red scale made in the Jordan Valley in 1933–34 is reported. Four, and occasionally five, generations were found to occur, the fertility of the species being 2.8 times as great as that of the California red scale. The species was found chiefly in the northern part of Palestine, but it spreads very rapidly and penetrates into every grove in the first years of fruit yielding.

Natural mortality of black scale during the winter of 1935–1936, R. H. Smith (*Calif. Citrogr., 22 (1936), No. 2, p. 59*).—A limited study of the mortality of black scale during the winter of 1935–36 is compared with the findings of previous winters (E. S. R., 74, p. 821).

Biological notes on the Chrysopidae, W. L. Putman (*Canad. Jour. Res., 15 (1937), No. 2, Sect. D, pp. 29–37, fig. 1*).—Further biological and ecological data on the Chysopidae (E. S. R., 68, p. 69; 69, p. 548), gathered during a study of the predators of the oriental fruit moth, are presented. The species concerned are *Chrysopa rufilabris* Burm., *C. plorabunda* Fitch, *C. downesi* R. C. Smith, *C. oculata* Say, *C. nigricornis* Burm., *Meleoma signoretti* Fitch, and *M. emuncta* (Fitch). Data on life history include relation of development to temperature,

number of generations, method of overwintering, and oviposition. The early stages of *C. downesi*, *M. signoretti*, and *M. emuncta* are described. Seasonal prevalence and fluctuations in abundance from year to year are discussed, and notes are given on natural control agencies. The value of chrysopids in the biological control of the fruit moth is summarized, with the conclusion that only in exceptional seasons are they of appreciable importance.

The biology of some Minnesota Trichoptera, D. G. DENNING (*Amer. Ent. Soc. Trans., 63 (1937), No. 1, pp. 17–44, figs. 48*).—A contribution from the Minnesota Experiment Station.

Biology of the tobacco moth and its control in closed storage, W. D. REED and E. M. LIVINGSTONE (*U. S. Dept. Agr. Circ. 422 (1937), pp. 39, figs. 22*).—This report on studies and observations at Richmond, Va., of the life history and distribution of the tobacco moth during the years 1931–34, earlier accounts of which by Back and Reed (E. S. R., 64, p. 547) and by Reed, Livingstone, and Morrill, Jr., (E. S. R., 69, p. 690) have been noted, summarizes the present knowledge of the pest in the United States, where it was first discovered in infested tobacco and reported upon in 1930, including its injury to tobacco, several stages, seasonal history, life history as studied in 1932 and 1933, and control.

A list is given of 22 references to the literature.

The European pine shoot moth in Sweden, T. PARR (*Jour. Forestry, 35 (1937), No. 3, pp. 269–273, fig. 1*).—A brief outline of the biology, relations to host trees, parasites and predators, and control of the European pine shoot moth, of which there is a heavy infestation in some extensive plantations of Scotch pine in southern Sweden, presented with a list of 15 references to the literature.

The introduction and colonization in Puerto Rico of beneficial insects parasitic on the pink bollworm of cotton, K. A. BARTLETT (*Puerto Rico Sta. Agr. Notes No. 77 (1937), pp. 5*).—In reporting upon work with parasitic enemies of the pink bollworm in Puerto Rico, a discussion of the importance of the pink bollworm as a factor in the production of long-staple cotton is followed by accounts of the introduction of more than 58,000 parasites of this bollworm, the life histories of the three imported species, namely, *Chelonus blackburni*, *Exeristes roborator*, and *Microbracon kirkpatricki*, of liberations of these species in cotton-growing areas, the finding of a single native parasite (*Perisierola* sp.) of the pink bollworm, and the recovery of all liberated species.

Adjusting the spray program and materials to control the codling moth, W. S. HOUGH (*Md. State Hort. Soc. Proc., 39 (1937), pp. 58–60*).—A brief practical contribution from the Virginia Experiment Station, presented before the Maryland State Horticultural Society at Hagerstown, Md., in January 1937.

Codling moth (*Maryland Sta. Rpt., 1936, pp. XXXVII, XXXVIII*).—Brief reference is made to the work of the year with two types of lead arsenate and with fish oil soap as a spreader in codling moth control.

Beta naphthol bands for codling moth control, A. M. WOODSIDE (*Va. Fruit, 25 (1937), No. 2, pp. 12, 14, 16*).—The results obtained in 1936 (E. S. R., 75, p. 376) with two brands of commercial bands and several types of home-made bands are reported upon.

The commercial bands proved superior in killing power, due it is thought to their having had a more even coating of chemical than is usually possible to obtain in home-made bands. "The addition of aluminum stearate to the dipping mixture did not increase the efficiency of the bands. Bands made with old oil drained from automobile crank cases gave as good results as bands made with new oil. Mixing the oil and beta-naphthol in a colloid mill

apparently did not increase the efficiency of the bands. Bands made from Cod-Ban, a proprietary mixture of oil and beta-naphthol, were generally more effective than other home-made bands with the same weight of coating. This is probably due to the oil and beta-naphthol being more intimately mixed than is possible with home-made mixtures, and to the beta-naphthol being in a finer condition."

A table is given showing the cost of banding per tree and per 100 worms destroyed during the 4 yr. 1933–36.

Chemically treated codling moth bands, F. SHERMAN III (*Michigan Sta. Quart. Bul., 19 (1937), No. 4, pp. 222–227, figs. 4*).—This practical contribution deals with the preparation of trees for banding and the application of bands, including proprietary treated bands, proprietary cold-dip mixtures, and home prepared hot-dip bands, and the dipping of the bands.

The hatching of spores of Nosema bombycis Nägeli and the partial development of the organism in tissue cultures, W. TRAGER (*Jour. Parasitol., 23 (1937), No. 2, pp. 226, 227*).—The author reports upon the emergence from the spore and the development of *N. bombycis* in silkworm tissue cultures.

European corn borer investigations: Experiments with insecticides on early sweet corn, C. H. BATCHELDER, D. D. QUESTEL, and N. TURNER (*Connecticut [New Haven] Sta. Bul. 395 (1937), pp. 269–285, figs. 5*).—A report is made of investigations undertaken by the station and the U. S. Department of Agriculture, cooperatively, for the purpose of determining the effectiveness of preparations of fixed nicotine, rotenone, and phenothiazine when employed against the first generation of the European corn borer under conditions prevailing in Connecticut. Several of the preparations that showed outstanding insecticidal effectiveness during the experiment are compared diagrammatically. All of the materials tested in field plats were highly toxic to larvae, the fact that some proved more suitable for general use than others being attributed to their superior physical properties, such as suspensibility, adhesiveness, and proportion of active particles in the residue.

"The attempt to develop a suitable dry concentrate of fixed nicotine which could be prepared in advance of its use as a spray, and stored, was not productive of an insecticide that withstood weathering satisfactorily. This is probably attributable to the loss of desirable physical properties that occurs when these materials are dried and reground. Likewise, a concentrate of nicotine and tannin in alcohol did not provide corn-plant protection equivalent to that of the field-reacted nicotine tannate standard.

"Tests of ground derris spray containing 4 lb. of derris to 100 gal. of water showed consistently satisfactory control when compared with the nicotine tannate standard used in the same spray schedule. Phenothiazine, when applied as a spray at the rate of 4 lb. per 100 gal. of water, was found to compare favorably with the nicotine tannate standard in reducing the number of borers infesting corn. Two grades of this material were tested in the field experiments, a recrystallized and a technical grade of relatively high purity. Both preparations provided satisfactory protection against corn borer infestation. Experiments undertaken for the purpose of determining the effectiveness of insecticides applied in dust form showed that the preparations of derris, phenothiazine, and nicotine tannate used were satisfactory. However, a newly developed preparation, dual-fixed nicotine, consisting of nicotine tannate and nicotine bentonite, gave a degree of control consistent with commercial requirements."

Tomato fruit worm: Field control, J. J. DAVIS (*Canner, 84 (1937), No. 12, II, pp. 125, 126; also in Canning Trade, 59 (1937), No. 36, pp. 12, 14, 16*).—Reporting from the Indiana Experiment Station it is pointed out that since field control of the corn earworm as a pest of tomato by the use of insecticides is

expensive and uncertain every other control practice should be understood and applied. Practices from the beginning of harvest until the tomatoes go into the finished product should be carefully supervised by the grower. There is considered to be a real need for a much more carefully planned and executed study of the physiology of the insect, with special reference to attractive baits for the moths as well as the possible attractiveness of restricted light waves; also a very complete study of cropping practices as related to abundance on tomatoes.

The introduction and colonization in Puerto Rico of beneficial insects parasitic on the sugarcane moth borer, K. A. Bartlett (*Puerto Rico Sta. Agr. Notes No. 78 (1937), pp. 8*).—After pointing out that the sugarcane borer through killing young plants and weakening older plants is the most important pest of sugarcane in the Western Hemisphere, accounts are given of introduced parasites, outlines of their life history, rearing of the Amazon fly *Metagonistylum minense* in the laboratory, liberation of beneficial species with the details in table form, and the aid of native parasites in borer control.

Resistance of winter wheats to hessian fly, W. R. Foster and C. E. Jeffery (*Canad. Jour. Res., 15 (1937), No. 4, Sect. C, pp. 135–140*).—In investigations at Saanichton, B. C., it was found that the stage of growth at the time of spring emergence of the hessian fly apparently accounted for the differential resistance of varieties of winter wheat. The varieties more advanced in growth appeared to be more resistant or freer from infestation than varieties less advanced. "There was a positive correlation ($r = +0.84$) between the number of days to maturity and infestation, and a negative correlation ($r = -0.63$) between the height of the wheat and infestation on April 1, about the time the fly emerges. . . .

"Nitrate of soda, superphosphate, and a complete fertilizer broadcast or drilled had no significant effect on hessian fly damage."

Studies on the higher Diptera of medical and veterinary importance.—The bot flies of the subfamily Oestrinae, W. S. Patton (*Ann. Trop. Med. and Parasitol., 31 (1937), No. 1, pp. 113–125, figs. 10*).—A continuation of the studies previously noted (E. S. R., 77, p. 222).

Infestation of oranges by the Mediterranean fruit fly during the autumn in Palestine, E. Rivnay (*Hadar, 9 (1936), No. 5, pp. 134, 135, 137*).—The various seasonal infestations of oranges by the Mediterranean fruitfly are considered. The infestation of citrus during the late summer and autumn is said to be due primarily to a premature ripening of the fruit, which may be caused by (1) late spraying with oil emulsion against the [California] red scale, (2) trees planted in too light, poor, and dry soil, (3) insufficient irrigation, or the exploitation of the moisture in the ground by cypress and eucalyptus trees, and (4) failing trees.

Studies on the genus Rhagoletis (Trypetidae), with special reference to Rhagoletis pomonella (Walsh), A. D. Pickett (*Canad. Jour. Res., 15 (1937), No. 3, Sect. D, pp. 53–75, figs. 25*).—An investigation of the biological and morphological relations of a number of species of the genus *Rhagoletis* is reported upon. An extensive study of the forms which develop in apple, hawthorn, and blueberry from the standpoint of their relations to their hosts led to the conclusion that they represent the single species *R. pomonella* (officially known as the apple or blueberry maggot), the females showing a decided preference to oviposit in the host in which they developed as larvae. A list of 35 references is included.

Descriptions of genera and species of the dipterous family Ephydridae, [I], II, E. T. Cresson, Jr. (*Amer. Ent. Soc. Trans., 61 (1935), No. 4, pp. 345–372; 62 (1936), No. 4, pp. 257–270*).—Three new genera (*Dagus*, *Paracoenia*, and

Parascatella) and 23 new species are included in the first contribution and 8 new species in the second.

Additional data on the biology and ecology of Strigoderma arboricola Fab. (Scarabaeidae, Coleoptera), C. H. HOFFMAN (*Bul. Brooklyn Ent. Soc., 31 (1936), No. 3, pp. 108–110; abs. in Minnesota Sta. Rpt. 1936, p. 27*).—Reporting upon the biology of *S. arboricola*, earlier work upon which by Hayes has been noted (E. S. R., 46, p. 252), it was found that fertile females deposit their eggs singly in the soil after a preoviposition period of 11 days. The duration of the egg stage varied from 11 to 25 days. The three grubs reared to maturity required from 160 to 164 days to complete their larval development on bluegrass sod. Since the feeding habits of the larva have not been determined under field conditions, the economic status of this stage is unknown. The prepupal period requires approximately 6 days and the pupal period about 13 days. Adults are attracted to many flowers in various habitats, and when abundant cause considerable damage to cultivated roses by feeding on the buds and flowers.

Seasonal trends in the relative abundance of Japanese beetle populations in the soil during the annual life cycle, H. Fox (*Jour. N. Y. Ent. Soc., 45 (1937), No. 1, pp. 115–126, figs. 2*).—Records kept of field surveys of the abundance of the soil-inhabiting population of the Japanese beetle conducted throughout the greater part of each year in a group of eight stations, all situated within 12 miles of the original point of entry of the beetle and covering a total range of seven consecutive years, reveal certain clearly defined trends in the course of its annual life cycle.

"The general trends shown in Japanese beetle populations as regards relative abundance during the annual life cycle are consecutively as follows: (1) A rapid increase beginning late in June and extending through the summer, coincident with the season of active egg deposition, resulting in (2) the population reaching its maximum abundance early in September. This is followed by (3) a brief interval of rapid decrease lasting until mid-October, (4) a long period of little or no apparent change extending through the winter and until about May 1 of the succeeding year, and (5) a second period of rapid decrease extending through May and into June, when adult emergence begins."

Pasture renovation in relation to populations of white grubs, R. F. FUELLEMAN and L. F. GRABER (*Jour. Amer. Soc. Agron., 29 (1937), No. 3, pp. 186–196, figs. 2*).—In renovation work in portions of 30 old bluegrass pastures in 1934 and 1935 by the Wisconsin Experiment Station, consisting of the establishment of dry-weather legumes, including alfalfa, sweetclover, and red clover, in permanent pastures without plowing, as described by Graber,[5] the populations of white grubs of the genus *Phyllophaga* in October 1935 and in the summer of 1936 were very small and injury was practically eliminated. In only 4 of the 15 renovations of 1934 were any white grubs found, and these with only 4,000 to 8,000 grubs per acre. In the adjacent unrenovated grass the grubs were present at the rate of 34,848 to 314,000 per acre, except in two densely sodded pastures, where no grubs were found in either the renovated or unrenovated portions. Compared with untreated grass, the 15 renovations of 1934 reduced the grub populations by an average of 98 percent.

In the 15 areas renovated in 1935 only 1 was free of white grubs, the remainder containing populations ranging from 3,178 to 74,000 per acre. In the unrenovated pastures from 47,916 to 333,000 grubs per acre were found. The average reduction in grub populations due to the renovations of 1935 was 91 percent. Renovation was much more effective in lowering the populations of

[5] Wis. Agr. Col. Ext. Circ. 277 (1936), pp. 23, figs. 16.

white grubs when it preceded the beetle flights of 1934 and 1935 than when it preceded that of 1935 only. Dense growths of dry-weather legumes reduced grub populations effectively, whether these plants were in the seedling or later stages of growth.

Control of potato flea beetles, F. A. Herman and J. F. Hockey (*Sci. Agr., 17 (1936), No. 4, p. 264*).—Control work with the potato flea beetle on a small area of tomato plants on August 20, 1936, to determine the effect of Cubor dust "75" (0.75 percent rotenone) and derris-gypsum dust (0.4 percent rotenone) is briefly referred to. Within an hour of a 6 p. m. application of the dust the ground was thickly dotted with wriggling beetles, and all were dead the following morning. No live beetles were found on the plants when examined 2 days later, and the control of the pest appeared to be practically complete. Ten days after the application the tomato plants were found to have occasional leaflets with from 3 to 5 beetles present and feeding.

An adjacent unsprayed plat of potatoes was found to have from 0 to 19 flea beetles per leaflet actually feeding. An application of 12–8–80 copper arsenate-lime dust was made on August 25, and the beetles were still present and feeding when examined a few days after treatment.

Recent developments affecting bark beetle control in Minnesota, L. W. Orr (*Minnesota Sta. Rpt. 1936, p. 29*).—Continuing earlier work (E. S. R., 74, p. 524), the author reports having found that control work for the bark beetles *Ips pini* and *I. grandicollis* cannot be conducted effectively during the period from November to May, since a large proportion of the overwintering adults are hibernating in the litter under the trees. "When beetle infestations occur following light ground fires, severe defoliation by other insects, prolonged drought or other injury, the affected trees should be removed and treated. The method of treatment will depend upon the state of development of the beetle brood. Young broods composed of eggs, larvae, and pupae can be killed by simply removing the bark from the infested material. Older broods, including young adults, can be killed by placing the infested logs in water or by spraying the logs with oil and then burning them sufficiently to scorch the bark. Infested material that is not valuable enough to save for wood or lumber should be piled or burned. The boles removed from the stand in connection with thinning and other cultural operations should be piled so as to hasten seasoning or should be removed from the area."

Notes on the wharf borer Nacerda melanura L., R. E. Balch (*Canad. Ent., 69 (1937), No. 1, pp. 1–5*).—Borers which riddled timbers in a wharf at Saint John, N. B., and required reconstruction owing to decay were found to be larvae of the edemerid beetle *N. melanura*. The notes presented relate to its biology, economic importance, and means of prevention.

Notes on the biology of the partridge-pea weevil Chalcodermus collaris Horn. (Coleop., Curculionidae), J. Alsterlund (*Ent. News, 48 (1937), No. 2, pp. 31–35, pl. 1*).—Observations of *C. collaris*, which was reared from the seed pods of the partridge-pea (*Cassia chamaechrista*) at Urbana, Ill., are reported.

The pepper weevil, C. C. Goff and J. W. Wilson (*Florida Sta. Bul. 310 (1937), pp. 12, figs. 3*).—This bulletin reports upon the appearance of the pepper weevil in Florida, its importance as a pest, observations of its life history, host plants, and control, and gives descriptions of its several stages.

An account of this weevil in the Southwest by Elmore, Davis, and Campbell in 1934 has been noted (E. S. R., 72, p. 511).

Changes in weight and nitrogen content of adult worker bees on a protein-free diet, M. H. Haydak (*Jour. Agr. Res. [U. S.], 54 (1937), No. 10, pp. 791–796*).—A report is made of an experiment conducted by the Wisconsin

Experiment Station in which bees of a known age were fed a pure carbohydrate diet for a period of 189 days, the bees in the last sample having been 236 days old. Weekly changes in the fresh and dry weight and in the nitrogen content of heads, abdomens, thoraces, and whole bees were ascertained.

"There was a substantial decrease both in weight and in nitrogen content of all parts of the bodies of the experimental bees, the greatest change taking place in the abdomens. A final decrease in the percentage of dry matter and of nitrogen in the fresh and dry weights occurred in the experimental bees. A slight increase in the dry matter of the heads and intestines and a considerable increase in the percentage of nitrogen in the dry matter of abdomens were exceptions. The significance of the latter findings is discussed. The greatest variation was in the percentage of dry weight and of nitrogen in the abdomens of the experimental bees. The smallest variation was in the thoraces. The necessity of removing the intestines before analyzing insects is emphasized."

The honeybee as pollinator of cultivated blueberries, F. R. SHAW and J. BAILEY (*Amer. Bee Jour., 77 (1937), No. 1, p. 30*).—The observations reported have led to the conclusion that (1) the varieties of blueberries tested were practically self-sterile, (2) the honeybee can and does pollinate the flowers of the varieties of blueberries used, and (3) bumblebees, solitary bees, and honeybees are all important pollinators of cultivated blueberries. Their relative importance as pollinators remains to be determined.

Burnet as a pollen plant, J. E. ECKERT (*Amer. Bee Jour., 77 (1937), No. 3, pp. 118, 119, figs. 2*).—It is claimed that the rosaceous forage plant *Sanguisorba minor*, known as burnet, an introduced species little known in this country but cultivated to a considerable extent in England and France, deserves the consideration of beekeepers in drought areas where there is a shortage of pollen and even in the irrigated areas where pollen plants are scarce after the close of fruit bloom. This plant withstands heavy pasturing in favorable locations, continuing to grow during the winter period, and is for this reason commonly used in pasture mixtures in England. Once well established it will withstand protracted periods of drought and should be well adapted to dry foothill situations in the coastal ranges of California, at the experiment station of which State it has yielded from 600 to 700 lb. of seed per acre.

Lespedeza as a honey plant, F. VAN HALTERN (*Amer. Bee Jour., 76 (1936), No. 11, p. 546*).—Notes are presented on a number of species of *Lespedeza* and their possible value as honey plants in the United States.

The nitrate reduction test and its significance in the detection of Bacillus larvae, A. G. LOCHHEAD (*Canad. Jour. Res., 15 (1937), No. 3, Sect. C, pp. 79–86*).—In this further contribution (E. S. R., 70, p. 367), the author reports having found that "*B. larvae* differs from most nitrate-reducing species in its ability to accumulate nitrite in nutrient solutions containing but small amounts of nitrate (0.001 percent). Most nitrate-reducing organisms show no accumulation of nitrite at this concentration owing to assimilation of nitrate or disappearance of nitrite through reduction or assimilation. With many nitrate-reducing bacteria disappearance of nitrite keeps pace with nitrite formation only up to a certain concentration, varying with the organism, above which nitrite may accumulate.

"The ability of *B. larvae* to accumulate nitrite in semisolid carrot or turnip extract media with no added nitrate is of considerable aid in the cultural test for this organism. Of five other organisms concerned with brood disease or occurring as contaminants in comb, which were grown in association with *B. larvae*, none showed interference with accumulation of nitrite by the latter except *B. orpheus*. With this species a positive nitrite test was dependent on

the relative development of the organisms, *B. larvae* exerting a certain antagonistic action. None of the eight species of bacteria tested prevented recognition of growth of *B. larvae* in the semisolid medium."

Descriptions and records of Nearctic mutillid wasps of the genera Myrmilloides and Pseudomethoca (Hymenoptera: Mutillidae), C. E. Mickel (*Amer. Ent. Soc. Trans., 61 (1935), No. 4, pp. 383–398*).—This contribution from the Minnesota Experiment Station presents records, notes, and descriptions of new species of two mutillid genera. A revised key to the genus *Pseudomethoca* Ashmead is included.

A revision of the genus Megachile in the Nearctic region, IV–VI, T. B. Mitchell (*Amer. Ent. Soc. Trans., 62 (1936), Nos. 2, pp. 117–166, pls. 4; 4, pp. 323–382, pls. 5; 63 (1937), No. 1, pp. 45–83, pls. 2*).—This contribution from the North Carolina Experiment Station is a continuation of the author's revision of the genus (E. S. R., 74, p. 524).

Control of injurious insects by a beneficial parasite, C. H. Alden and J. E. Webb, Jr., (*Ga. Dept. Ent. Bul. 79 (1937), pp. 23, figs. 10*).—The results of work conducted in Georgia since 1929, in which year a laboratory was erected at Cornelia, on the mass production of the egg parasite *Trichogramma minutum* and of the Angoumois grain moth, employed as a host in mass production, are reported. The details of colonization work in codling moth and oriental fruit moth control are given in 11 tables. Parasites were also used as an aid in the control of the pecan shuck worm, nut casebearer, leaf casebearer, budworm, hornworm, and grain moth. The parasites have been colonized in 93 counties, being used to reduce the insect infestation on apple, peach, pecan, and truck farms. During the period 1929–36, 138,210,250 parasites were furnished to Georgia farmers.

"Many experiments were conducted to determine the effectiveness of *T. minutum*. The peach experiments showed that in 1931 the infestation in the colonized areas was 16.3 percent fruit moth at harvest and 31.5 percent fruit moth in noncolonized areas at harvest. In 1936 the infestation in colonized areas was 0.15 percent, and in the noncolonized areas 0.55 percent. Fruit moth egg collections showed an average parasitism of 46.0 percent in 1930, 12.5 percent in 1931, and 36.1 percent in 1932. The apple experiments showed that in 1933 the infestation in colonized areas was 32.4 percent codling moth at harvest and 60.6 percent codling moth in the noncolonized areas at harvest. In 1935 the infestation in colonized areas was 16.2 percent and in the noncolonized areas was 24.3 percent. During the period of the tests 31,632 codling moth eggs were collected in various apple orchards in the State. The highest number of eggs found parasitized at any one collection was 97.6 percent in 1933 and the lowest 0.0 percent in 1933 and 1934; the highest yearly average for the period was 77.6 percent in 1932 and the lowest yearly average 26.2 percent in 1936."

A map and photographs are given which show the distribution of parasites by crop and counties and the type of equipment used in the production of the parasite.

The distribution of black widow spiders, B. J. Kaston (*Science, 85 (1937), No. 2194, p. 74*).—In this contribution from the Connecticut [New Haven] Experiment Station, attention is called to records of the occurrence of *Latrodectus mactans* (Fab.) in States overlooked in some earlier reports. Several new records of the occurrence of this spider in Connecticut and Vermont are given, together with a list of 15 references to the literature.

The black widow spider in Virginia, H. A. Allard (*Science, 85 (1937), No. 2194, pp. 74, 75*).—Observations of the habits of this spider (*Latrodectus mactans*), with records of its occurrence in Virginia and Georgia, are noted.

Notes on the distribution of the black widow spider, L. D. ANDERSON and H. G. WALKER (*Science, 85 (1937), No. 2195, pp. 100, 101*).—Data on the occurrence of *Latrodectus mactans* are given in this contribution from the Virginia Truck Experiment Station.

Contributions to the knowledge of the red spiders in Palestine, I, II, H. Z. KLEIN (*Hadar, 9 (1936), Nos. 4, pp. 107–111, figs. 4; 5, pp. 126–132, figs. 8; 9, pp. 195, 197–199, figs. 3; 10, pp. 219, 220, 222, 223, 225, figs. 3*).—This contribution is presented in two parts.

I. *The oriental red spider Anychus orientalis Zacher* (pp. 107–111, 126–132).—A report of studies of the biology and control of the most important of the red spiders attacking citrus in Palestine. There are 18 generations during the year in the coastal plain area, where its life cycle may be completed in the summer in a period of 8 days. Control work has shown that vegetoalkaloids do not destroy the pest, and that emulsions of white oil in a concentration of 1.5 percent for spraying and sulfur for dusting are the only materials of value.

II. *The common red spider Epitetranychus althaeae V. Hanst* (pp. 195, 197–199, 219, 220, 222, 223, 225).—The biology and control of the common red spider, which in Palestine frequently appears in the spring on citrus leaves in nurseries and young groves the first year after planting and inflicts damage identical with that caused by *A. orientalis*, are reported upon. It has been found to rear over 20 generations during the year in the coastal plain of Palestine. Up to the time of writing, 63 host plants had been discovered in Palestine, 60 percent of which are cultivated plants, about 10 percent being trees and 90 percent grasses, bushes, and creepers. The pest is controlled by dusting with sulfur or spraying with a white oil emulsion of 1.5 percent if applications are made immediately upon its first appearance.

Ornithodoros turicata: The possible vector of relapsing fever in southwestern Kansas.—Preliminary report, G. E. DAVIS (*Pub. Health Rpts.* [*U. S.*], *51 (1936), No. 50, p. 1719*).—Approximately 2,000 specimens of *O. turicata*, hitherto not known to occur in Kansas, were collected in Clark County, where 11 cases of relapsing fever occurred from 1931 to 1934, inclusive. Other cases have since been reported from this and nearby counties.

"The various stages of this tick were found in rodent burrows, in holes in sand, and attached to cottontail rabbits, one immature jack rabbit, spermophiles, prairie dogs, prairie-dog owls, and terrapins. Eleven hundred and ninety-seven ticks were removed from a single sand hole which contained 11 terrapins (*Terrapene ornata*). These ticks were later tested for spirochetes at the Rocky Mountain Laboratory by permitting them to engorge on white rats. Three strains of spirochetes were recovered from three localities, viz, from ticks collected from a prairie dog burrow in the south-central part of Clark County, from a sand hole (no host present) in the extreme eastern part, and from a cottontail rabbit burrow in the face of a limestone outcropping in the extreme western part. The prairie dog burrow was located on a ranch where a case of relapsing fever had occurred."

Six years' intensive observation on the seasonal prevalence of a tick population in western Montana.—A preliminary summary, C. B. PHILIP (*Pub. Health Rpts.* [*U. S.*], *52 (1937), No. 1, pp. 16–22, fig. 1*).—The results of a study of the adult Rocky Mountain spotted fever tick (*Dermacentor andersoni*) population on the vegetation of a 40-acre tract in the Bitterroot Valley of Montana are reported. The findings are based upon draggings made biweekly or weekly, according to conditions, through the tick season of 1930 and the five following seasons.

ANIMAL PRODUCTION

The American Society of Animal Production: Record of proceedings of the twenty-ninth annual meeting, November 27 and 28, 1936 (*Amer. Soc. Anim. Prod. Proc., 1936, pp. 341, figs. 13*).—This is a report of the annual meeting held at Chicago in 1936 (E. S. R., 75, p. 527). The following papers were presented in the dairy cattle, beef cattle, swine, horse, sheep, nutrition, and meats sections:

A Symposium on the Increased Use of Forage and Roughage in Livestock Production, by W. J. Loeffel (pp. 9–12); Increased Use of Roughage and Pasture in Production of Beef Cattle, by F. G. King (pp. 12–15); Increased Use of Forage and Roughage in Dairy Production, by C. F. Huffman (pp. 15–21); Increased Use of Pasture and Forage in Sheep Production, by A. E. Darlow (pp. 21–24); The Increased Use of Forage and Roughage in Horse Production, by C. W. McCampbell (pp. 24–26); Possibilities of Increasing the Use of Forage and Roughage in Swine Production, by W. E. Carroll (pp. 26–29); Procedure in Pasture Research, by E. B. Forbes (pp. 32–37); Fundamentals of Successful Breeding, by A. J. Glover (pp. 37–41); Effect of Rock Phosphate on the Dairy Cow, by W. P. Elmslie (pp. 44–48); The Occurrence of Milk Fever in the Kentucky Station Herd Over a Period of Twenty Years, by H. J. Metzger and H. B. Morrison (pp. 48–52); The Relation of Age at First Calving to Butterfat Production in the First Five Lactations, by A. B. Chapman and G. E. Dickerson (pp. 52–55); Performance of Dairy Cows on an Unusual Calcium-Phosphorus Ratio, by A. H. Kuhlman, E. Weaver, W. D. Gallup, and A. Nalbandov (pp. 55–57); Make Worn Out Land Pay in Pasture for Beef Cattle, by E. S. Good (pp. 58–60); The Use of Varying Quantities of a 45 Per Cent Protein Supplement in a Ration for Fattening Calves, by P. Gerlaugh (pp. 60–63); Barley as a Feed for Beef Cattle, by A. D. Weber (pp. 63–67); Finish in Beef Cattle From the Standpoint of the Consumer, by R. M. Watkins (pp. 67–70); Fattening Steers on Pasture, by E. F. Rinehart (pp. 70–72); A Method of Measuring Performance in Beef Cattle, by W. H. Black and B. Knapp, Jr. (pp. 72–77); A Preliminary Study of Variations in Free-choice Intake of the Components of a Standard Ration and Breeding as Possible Factors in the Occurrence of Lameness in Pigs, by N. R. Ellis, W. A. Craft, and J. H. Zeller (pp. 77–81); The Utilization of Oat Meal Feed by Growing, Fattening Swine in Dry-Lot, by A. W. Lathrop and G. Bohstedt (pp. 82–87); Making Cottonseed Meal Safe and Effective When Fed as the Only Protein Concentrate to Pigs in Dry Lot, by W. L. Robison (pp. 87–91); Preliminary Report on Values of Pastures for Fattening Pigs in Louisiana, by C. I. Bray (pp. 91–93); A Study of Methods for Obtaining Measurements of Swine, by R. W. Phillips and W. M. Dawson (pp. 93–99); Boar Semen Studies.—A Preliminary Report, by F. F. McKenzie, J. C. Miller, and L. C. Bauguess (pp. 99–102); Swine Production in the Southeast, by W. G. Kirk (pp. 103–106); Distillery Slop as a Feed for Pigs, by E. J. Wilford (pp. 106–110); Hardness of Dent Corn as a Factor in Its Nutritive Value for Fattening Pigs, by A. L. Anderson, C. C. Culbertson, J. L. Robinson, and W. E. Hammond (pp. 110–114); Reed Canary Grass Hay for Fillies, by A. L. Harvey (pp. 114, 115); Barren Mares, by J. P. Hutton (pp. 116–118); Subject Matter in Freshman Courses Pertaining to Horses, by A. B. Caine (pp. 119–123); My Impressions of English Horse Breeding, by H. D. Linn (pp. 123–126); Horse Extension Activities That Bring Results, by L. P. McCann (pp. 126–130); The Kellogg Institute of Animal Husbandry, by G. H. Hart (pp. 130–135); Training Horses for Work and Pleasure, by J. A. Gorman (pp. 135–137); Cottonseed Meal as a Feed for Ponies, by M. G. Snell (pp. 138–140); Bureau of Animal

Industry Program for Horse Improvement, by J. O. Williams and H. C. McPhee (pp. 141–143); Digestion Experiments With Mixtures of Sweetclover and Albit Wheat Forage Ensiled and Cured as Hay, by J. Sotola (pp. 143–147); The Digestibility of Range Bunch Grasses Fed Alone and Supplemented to Sheep, by R. McCall (pp. 147, 148); Predicting the Yield of Raw Wool From Its Density Under Pressure, by R. H. Burns and A. Johnston (pp. 148–155) (E. S. R., 77, p. 526); A Comparison of Fleeces from B and C Type Rambouillet Ewes, by J. M. Jones, P. Homeyer, S. P. Davis, W. H. Dameron, and B. L. Warwick (pp. 155–158); The Effect of Feed on Quality of Lambs, by C. Harper (pp. 158–162); A Comparison of Temporary Forage Crops for Lambs and Sheep, by J. P. Willman (pp. 162–165); Fattening Late Native Lambs, by L. A. Weaver (pp. 165–169); The Persistence of Stomach Worms on Bluegrass Pasture, by W. G. Kammlade, R. Graham, and L. E. Boley (pp. 169–172); The Middle Ground in Finishing Livestock to Meet Market Preferences, by C. D. Lowe (pp. 197–201); Sweetening Dry Bluegrass, by L. F. Graber (pp. 201–204); The Soil Conservation Program and Its Effect on Meat Animal Production, by I. B. Johnson (pp. 204–208); Lamb Feeding in the Indianapolis Area, by S. Meiks (pp. 208–212); The Objectives and Functions of the National and Local Live Stock Exchanges, by P. G. Adams (pp. 212–217); Grass and Turnips and the Part They Play in Meat Production in Britain, by W. Biggar (pp. 217–221); The Mortality of Calves in the Iowa State College Dairy Herd, by J. Ingels and C. Y. Cannon (pp. 223–229); The Rate of Breeding and Lambing and the Length of Gestation Period of Range Ewes, by D. W. Chittenden and A. H. Walker (pp. 232–236) (E. S. R., 77, p. 526); The Nutritive Instincts and Food Habits of Superior Individuals as Guides to the Nutritional Requirements of the Group, by W. F. Dove (pp. 243–247); The Value and Limits of Usefulness of the Insensible Loss in Weight as a Measure of Heat Production of Cattle, by M. Kriss (pp. 265–272); Does the Calcium or Phosphorus Content of Common Mineral Mixtures Conform to Experimental Findings? by G. Bohstedt (pp. 272–278); Digestible Nutrients and Metabolizable Energy in Russion Thistles, and in Light and Heavy Wheat and Barley and in Emmer, by F. W. Christensen and T. H. Hopper (pp. 279–282); Some Observations Pertaining to Tenderness of Meat, by D. L. Mackintosh, J. L. Hall, and G. E. Vail (pp. 285–289); The Influence of Retarded Growth in Lambs on Flavor and Other Characteristics of the Meat, by N. G. Barbella, O. G. Hankins, and L. M. Alexander (pp. 289–294); The Relation of Degree of Finish in Cattle to Production and Meat Flavors, by G. A. Branaman, O. G. Hankins, and L. M. Alexander (pp. 295–300); and Things Stockmen Do That Affect Their Returns, by R. C. Ashby (pp. 300–304).

[Investigations with livestock in Nebraska] (*Nebraska Sta. Rpt. [1936], pp. 9, 26–33, 34–36, 41, 44, 45*).—Beef cattle studies reported include a comparison of cottonseed cake, tankage, and 37 percent protein soybean cubes as supplements to a silage ration and to a corn-alfalfa ration for fattening steers; corn silage v. corn and weed silage (approximately 50 percent weeds) for steer feeding; grainless silage, cottonseed cake, and a half feed of corn for wintering yearling and calf heifers and the time and feed requirement for finishing these heifers; and molasses v. corn for yearling heifers. At the North Platte Substation tests were conducted on feeding steers on native grass and alfalfa pasture, wintering steer calves, and the use of varying properties of barley in the steer fattening ration, and at the Valentine Substation on the effect of winter rations on the development of range heifers that calve as 2-year-olds

Swine tests yielded information on full feeding pigs on Sudan grass; various process soybean oil meals for feeding pigs in dry lot, and protein supplementary mixtures for pigs in dry lot. Tests at the North Platte Substation are noted on soybean oil meal, fish meal, and Wheatland milo for fattening hogs.

From sheep studies results are noted on the corn and alfalfa hay rations for fattening lambs, dry-lot summer rations for native lambs, cane molasses in the lamb fattening ration, and the effect of injection of serum from a pregnant mare on earliness of conception of ewes.

Experiments with poultry gave results on the nutrient requirement for growing chicks and poults; the effects of additions of iron to a standard ration for growing turkeys; the comparative efficiency of various proteins in poultry feeding; the effect of fineness of grinding on the palatability of poultry feeding stuffs; the use of pigweed seed in a ration for chicks; the comparative value of rye, cooked rye, and wheat in poultry rations; the value of different qualities of alfalfa in a chick ration; and from the Valentine Substation flock testing to determine the extent and influence of differences in turkey flocks.

[Investigations with livestock in Ohio] (*Ohio Sta. Bul. 579 (1937), pp. 84–93, 112–114, 122, figs. 2*).—Beef cattle studies reported include varying proportions of corn and legume hay in rations for fattening steers, by P. Gerlaugh and C. W. Gay; the acre returns from corn fed as silage and as corn-and-cob meal plus bundle stover both for yearling steers and steer calves, by Gerlaugh and H. W. Rogers; the addition of protein supplement to a full feed of corn for calves on pasture, and the optimum quantity of protein supplements for fattening steer calves, both by Gerlaugh; and the mechanical and biological processing of feeds for cattle, by Gerlaugh, C. H. Kick, A. J. Schalk, and E. A. Silver.

Swine tests yielded information on a method for making cottonseed meal a safe and effective supplement for pigs, dried skim milk and solvent and expeller soybean oil meals for pigs in dry lot, and various tankage materials as protein supplements for pigs, all by W. L. Robison; and dry-rendered reduction and packing plant tankage for pigs, by Robison, P. A. Jones, and R. C. Beatty.

From sheep studies data are reported on the calcium requirements of lambs, by D. S. Bell, Kick, and B. H. Edgington; winter rations for ewes and lambs, and feeding western lambs, both by Bell; and winter roughages for sheep, by Bell and Foley.

Nutrition experiments reported include the efficiency of vitamin D from cod-liver oil and irradiated cholesterol for laying hens, and the stability of carotene and vitamin A in a mixed ration, both by R. M. Bethke, P. R. Record, and O. H. M. Wilder; vitamin G (flavin) studies with chicks, by Bethke and Record; the vitamin G (complex) requirements of the chicken, by C. H. Hunt, Record, and Bethke; the vitamin A requirements of laying birds, by Record, Bethke, Wilder, and V. D. Chamberlin; and methods of separating the various constituents that make up the vitamin B group, by Hunt. Poultry tests include methods of feeding layers, soybean hay v. alfalfa for layers, and management tests with chicks and growing pullets, all by D. C. Kennard and Chamberlin.

Feeds and feeding, abridged, F. B. Morrison (*Ithaca, N. Y.: Morrison Pub. Co., 1937, 7. ed., pp. VI+503, figs. 126*).—The seventh edition of this popular text, adapted and condensed from Feeds and Feeding (twentieth edition) (E. S. R., 77, p. 11), is noted.

The composition of grass laid up for winter keep, B. Thomas and B. M. Boyns (*Empire Jour. Expt. Agr., 4 (1936), No. 16, pp. 368–378*).—Information is presented from Armstrong College, Newcastle, England, on the composition of winter herbage on two permanent pasture areas which had been protected from grazing from August 4 to October 27, and one of which was grazed throughout

the winter period. Samples were taken on October 17 and at 4-week intervals thereafter until April.

The nutritive value of winter grass, as judged by its chemical composition, is inferior to summer grass but showed a relatively high mineral content and was similar in feeding value to month-old summer grass from an inferior pasture area. It is suggested that the practice of laying up grass for winter grazing may be considered a useful means of feed conservation.

Water soluble carbohydrates in forage crops and their relation to the production of silage, J. K. Wilson and H. J. Webb (*Jour. Dairy Sci., 20 (1937), No. 5, pp. 247–263*).—This contribution from the [New York] Cornell Experiment Station presents information on the water-soluble carbohydrate content of a considerable number of leguminous and nonleguminous plants. Analyses were made on freshly cut samples collected at various stages of maturity. Results are expressed as the percentage of fermentable carbohydrates in the sap of the plant, in the fresh and dry weight of the plant, and in the moisture calculated to a uniform 80-percent basis for each sample. Nonleguminous plants averaged very much higher in water-soluble carbohydrates than the legumes, which probably explains why the latter crops so frequently failed to produce a silage of satisfactory quality. A number of silage-making trials are reported in which various grasses and legumes were ensiled with additions of fermentable sugars such as corn sugar and molasses. Also mineral acids and mixtures of organic and mineral acids were employed to reduce the pH of the material to a point which greatly reduced the microbial activity. It is shown that legume silages of superior quality can be produced by these methods. The desirability of phosphoric acid as a preservative is suggested.

The effect of feeding cobalt to rats, S. W. Josland (*New Zeal. Jour. Sci. and Technol., 18 (1936), No. 5, pp. 474–480, figs. 4*).—This study was undertaken following observations that the addition of small quantities of cobalt in the diet prevented ailments in sheep and other livestock (E. S. R., 76, p. 250; 77, p. 390). The addition of 1 percent of anhydrous cobalt sulfate to the diet of two rats produced an intense polycythemia and loss of body weight within a 7-week period. There was a marked increase in the cobalt content of the carcasses as compared with control animals, the highest relative storage and the greatest concentration of cobalt occurring in the liver whereas in normally fed rats the highest concentration occurred in the pancreas. There was no evidence of cirrhosis in the liver of the rats receiving the cobalt supplement.

The distribution of magnesium in the animal organism and the effect of dietary magnesium, I. J. Cunningham (*New Zeal. Jour. Sci. and Technol., 18 (1936), No. 4, pp. 419–423*).—Data are presented on the magnesium content of the bone ash of various portions of the sheep skeleton, the magnesium content of various organs of sheep, cattle, and rats, and the effect of various levels of magnesium intake on the magnesium content of certain organs, blood, and bone of rats.

The distribution of magnesium appears to be uniform throughout the bones of an individual animal. The content of this element in a given organ is closely similar in individuals of the same or of different species, but there is considerable variation in the content in various organs and muscles of a single individual. In rats severe dietary restriction of magnesium reduced its content in blood serum and bone only, while increased intake resulted in a marked increase in bones and blood serum, other organs of the body being unaffected.

The anti-hemorrhagic vitamin, H. J. Almquist (*Poultry Sci., 16 (1937), No. 3, pp. 166–172*).—This is a review of the available information on the antihemorrhagic vitamin, the material being classified under the following sub-

headings: (1) Preliminary indications of existence, (2) proof of existence as a new dietary factor, (3) functional properties, (4) physical and chemical properties, and (5) methods of determination. An extensive bibliography is appended.

Chemical and physical studies on the antihemorrhagic vitamin, H. J. Almquist (*Jour. Biol. Chem., 117 (1937), No. 2, pp. 517–523*).—Based on further studies of the yellow, viscous oil concentrate of the antihemorrhagic vitamin previously described (E. S. R., 76, p. 581), results are presented indicating that the antihemorrhagic vitamin is a complex, colorless, unsaturated substance, markedly unstable to alcoholic alkalies even in the absence of air. The concentrate contained a small amount of nitrogen, but no sulfur or phosphorus. Color tests indicated the presence of the indole nucleus. The concentrate is inactivated by exposure to direct sunlight, either under an atmosphere of carbon dioxide or under vacuum.

The gizzard factor of the chick, H. J. Almquist and E. L. R. Stokstad (*Jour. Nutr., 13 (1937), No. 4, pp. 339–350, fig. 1*).—This report essentially confirms previous findings by the authors (E. S. R., 76, p. 88). The results definitely indicate that gizzard erosions or lesions of the chick are caused by a deficiency in the diet of a fat-soluble factor which is not identical with any of the known vitamins. The comparative potencies of a considerable number of supplements with reference to their ability to prevent hemorrhagic and gizzard erosions are indicated, with evidence that the two factors can be clearly differentiated. Fresh and dried greens and wheat bran are considered the best practical sources of the gizzard factor. It appears to be quite unstable, being readily destroyed by heat and by alcoholic potash. It is readily adsorbed from hexane solution by activated magnesium oxide and appears to be in the saponifiable fraction. It is concluded that the presence or absence of gizzard erosions or of the gizzard factor in the ration does not appreciably affect the growth rate of chicks.

The multiple nature of the vitamin D of fish oils, C. E. Bills, O. N. Massengale, M. Imboden, and H. Hall (*Jour. Nutr., 13 (1937), No. 4, pp. 435–452*).—The authors have assayed the liver oils of 25 species of fish for vitamin D potency in comparison with cod-liver oil on both rats and chickens. The relative effectiveness of the vitamin D for chickens, rat unit for rat unit, is expressed on the basis of cod-liver oil=100. On this basis, oils from the bluefin tuna of California were relatively the least effective for chickens, while the oil from the white sea bass of California was approximately 18 times as effective. Other oils covered a lesser but wide range of effectiveness, some of them closely resembling cod-liver oil. It is concluded that these observed differences in effectiveness were due to the existence of two or more forms of vitamin D. Irradiated ergosterol was less effective for chickens than any of the fish oils. Irradiated 7-dehydrocholesterol was about the same as cod-liver oil or irradiated ordinary cholesterol but inferior to that of white sea bass liver oil.

Composition of bones: Note on some New Zealand bones—normal and abnormal, M. W. Young (*New Zeal. Jour. Sci. and Technol., 18 (1936), No. 4, pp. 391–395*).—This report from the New Zealand Department of Agriculture presents data on the composition of the femur bones of sheep grown on normal or good livestock-producing areas, including animals from 4 mo. to 4 yr. of age, to indicate the effect of age on bone composition. Comparable data are presented for sheep grown on five areas in which pasture composition was abnormal and stock trouble had been experienced. In all cases the bones of sheep grown on the deficient areas were abnormal and were generally characterized by a high percentage of water and a low ash: organic matter ratio.

Studies in mineral metabolism.—XXXIV, The effect of sulphur upon the weight and wool production of sheep when food intake is not limited, P. J. du Toit, A. I. Malan, J. W. Groenewald, and M. L. Botha (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 7 (1936), No. 1, pp. 181–188, fig. 1*).—Continuing this series (E. S. R., 76, p. 373), the findings of this study indicate that 5 g. of sulfur per sheep daily can be fed over a prolonged period without detrimental effects. The body weight, food consumption, and wool production are apparently not significantly affected by the sulfur administered.

Gradients in wool growth, A. B. Wildman (*Nature [London], 139 (1937), No. 3511, pp. 285, 286*).—Analysis of wool fibers from Suffolk, Cheviot, and Welsh Merino sheep indicated the existence of a definite britch-poll gradient in mean fiber fineness similar to the britch-poll fiber-type array gradient suggested by Galpin (E. S. R., 76, p. 519). There was also evidence of a main anteroposterior gradient in number of fibers per unit area and in straight length of fiber. These conditions may be explained on the basis of greater physiological skin activity in the forward parts of the body than in the britch region, this greater activity being expressed by a greater number of follicles and number of fibers per unit area and not by the production of coarser fibers.

Some characteristics which enter into the assessment of wool quality, and their estimation in the fleece, A. B. Wildman (*Jour. Textile Inst., 27 (1936), No. 7, pp. 181–193, fig. 1*).—This report deals primarily with a preliminary study of methods of fleece sampling and analysis, chiefly for fineness, length, density, and kemp production. The methods employed are fully described. Statistical analysis of a limited amount of data indicates a significant variation in fiber fineness and possibly in fiber density between various areas on the body, but there was a tendency for mean length of fiber to be constant throughout the fleece.

Crimp of Merino wool a periodic function of time? J. C. Swart and J. J. J. Kotzé (*Empire Jour. Expt. Agr., 5 (1937), No. 17, pp. 69–74, figs. 5*).—Studies at the Stellenbosch-Elsenburg College of Agriculture, Union of South Africa, on the length and crimp of wool fibers from Merino wool showed considerable variation in the number of crimps and length of fibers composing a sample from a 4 sq. cm. area of body surface. The average correlation coefficient between number of crimps and length of fibers was found to be 0.921±0.048; and the regression values ranged from 1.3 to 2.1 crimps for each 5 mm increase in length of fiber. The decrease in number of crimps per unit of straight fiber length as fiber length increases is attributed to an increase in the depth and spacing of crimp as the fiber length increases.

Seasonal variations in lamb-skins, with special reference to the sudoriferous glands, P. White and F. G. Caughley (*New Zeal. Jour. Sci. and Technol., 18 (1936), No. 5, pp. 466–473, figs. 16*).—In this study a number of lambs were slaughtered at the first of each month, and samples were taken from the fresh skins. By making a detailed study of the sudoriferous glands according to described technic, it was evident that as perspiration is increased due to seasonal or other conditions these glands may enlarge to such an extent as to impair the leather-producing quality of the skins, resulting in the production of soft, spongy, or "loose" leather. As the necessity for perspiration decreased the size of these glands readily decreased.

Karakul fur sheep breeding, K. Jahn (*Chicago: Breeder Pubs., 1937, pp. 128, [figs. 34]*).—This book is intended to familiarize the Karakul sheep breeder or prospective breeder with practical suggestions, reports, statements, and experimental work done in this branch of the fur industry.

The influence of soybeans upon the gains, feed requirements, and character of the fat produced when fed to growing and fattening spring pigs on rape pasture, C. C. CULBERTSON, B. H. THOMAS, F. J. BEARD, and W. E. HAMMOND (*Iowa Sta. Anim. Husb. Leaflet 150 (1936), pp. 6*).—Eight types of rations were compared in this study. Cracked shelled corn was the basis of all, and all lots of pigs were on rape pasture and were self-fed a mineral mixture. Various protein supplements included tankage self-fed, cracked soybeans self-fed, and additions of 5, 10, and 20 percent of cracked soybeans, 10 percent of soybean oil meal, or 9.9 percent of soybean oil meal plus 1.3 percent of soybean oil with corn, the grain mixtures being self-fed in all cases.

Pigs receiving soybeans free choice consumed a heavy allowance, particularly during the latter part of the trial, amounting to about 12 percent of the ration over the entire period. Corn consumption was correspondingly reduced and the rate of gain per unit of feed was relatively high. The pigs receiving 10 percent of soybean oil meal made slightly more rapid gains and required less feed per unit of gain than those receiving 10 percent of cracked soybeans. Additions of soybean oil to the corn-soybean oil meal ration improved its effectiveness in promoting gains. Soybeans in the diet had a pronounced detrimental effect on the hardness of the fat. The iodine number of the fat from pigs receiving no protein supplement and the above-listed supplements in order averaged 68.87, 67.91, 78.76, 72.98, 79.99, 85.25, 71.92, and 79.17, respectively. It is concluded that more than 5 percent of soybeans in the ration over the entire growing and fattening period will result in undesirable carcasses from the standpoint of the firmness of the fat.

White rats as experimental animals in studies on the soft-fat problem, H. E. ROBINSON, R. E. GRAY, *and* R. C. NEWTON (*Food Res., 1 (1936), No. 5, pp. 413–418*).—This is the report of two series of experiments designed to study the comparative effect on rats of rations known to produce varying degrees of hardness of fat in swine. The first series of diets was similar in composition to swine rations reported above and the second series was designed to test the value of adding highly saturated fats to diets containing large amounts of soybeans and peanuts.

While rats apparently deposited a somewhat softer fat than swine, the general effect of the rations was quite similar in both types of animals, there being a striking parallel in the character of the body fat formation. The addition of saturated fats of high melting point and low iodine number tended to offset the effect of soybean or peanut oils. It appears that rats are satisfactory experimental animals for use in studying the soft-fat problem.

Calcium and phosphorus supplements for growing swine, H. H. MITCHELL, W. E. CARROLL, T. S. HAMILTON, W. P. GARRIGUS, and G. E. HUNT (*Illinois Sta. Bul. 434 (1937), pp. 13–54*).—The results of four experiments are reported on (1) a comparison of complex v. simple mineral mixtures, (2) the comparative values of bonemeal, limestone, and rock phosphate as calcium supplements, (3) the comparative utilization of phosphates and normal carbonate of calcium, and (4) the likelihood of phosphorus deficiency in ordinary swine rations. The paired feeding technic was employed in all trials, and the effectiveness of the various mineral supplements was judged according to the rate of growth of the pigs, the weights and chemical analyses of the bones, and the retention of minerals and nitrogen as determined by metabolism studies.

The use of a very complex mineral mixture as a supplement to basal rations of either corn and tankage or corn and soybean oil meal proved no more effective than a simple supplement of common salt and steamed bonemeal in promoting growth and general health of the pigs. However, the addition of

ground limestone (15 g per head daily) to a basal ration of ground corn and soybean oil meal (with 1 percent of salt) produced heavier bones containing less moisture and more mineral matter and a higher percentage of both calcium and phosphorus in the bone ash.

Comparative trials with steamed bonemeal and ground limestone as supplements showed no significant differences in rate of gain of the pigs, although the bonemeal produced bones of greater weight and higher ash content. Rock phosphate fed at a level to supply 5 g of calcium daily exerted a definite and cumulative toxic effect which was greater than that produced by feeding pure tricalcium phosphate and calcium fluoride to provide the same intakes of calcium and fluorine. However, feeding rock phosphate at this level had no detrimental effect on the composition of the bones.

Ten-day metabolism trials with pigs variously receiving supplements of calcium carbonate and monocalcium, dicalcium, and tricalcium phosphates indicated no significant differences in the calcium retention from the carbonate, dicalcium phosphate, or tricalcium phosphate supplements, while retention on the monocalcium phosphate was slightly but significantly less.

Trials with various phosphate supplements indicated that in the presence of adequate calcium and vitamin D a phosphorus concentration of from 0.3 to 0.35 percent in a ration composed mainly of corn is adequate for maximum growth and bone development. A ration consisting mainly of corn and adequately balanced with respect to protein will not require a phosphorus mineral supplement. Under such conditions the only minerals required are salt and (if a vegetable protein concentrate is used) some form of calcium carbonate.

Studies in the quality of Maryland hams (*Maryland Sta. Rpt. 1936, p. XXIV*).—The effects of various curing mixtures and varying conditions in the storage chamber for curing hams are briefly noted.

The clinical examination of brood mares for pregnancy, W. W. Dimock (*Cornell Vet., 26 (1936), No. 4, pp. 314–323, figs. 2*).—The contribution from the Kentucky Experiment Station describes the main points to be observed in the successful clinical diagnosis for pregnancy in brood mares, with particular references to the palpation of the uterus through the rectum.

Scientific reports of the Sixth World's Poultry Congress [held at Berlin and Leipzig, July 24 to August 2, 1936] (*Wissenschaftliche Berichte des VI. Weltgeflügelkongresses, 1936. Leipzig: Reichsmin. Ernähr. u. Landw., 1936, vols. 1, pp. XX+367, figs. [54]; 2, pp. [VII]+276, figs. [46]; 3, pp. 530, figs. [19]; Eng. Summaries, pp. [XII]+94*).—The following papers in English, German, French, Italian, or Spanish, with abstracts in these languages (E. S. R., 73, p. 222), were presented in the various sections, those in the section on hygiene and disease being noted on page 702.

General reports.—International Efforts and Prescriptions of Veterinary Police in Relation to Infectious Poultry Diseases, by H. C. L. E. Berger (pp. 1–9); International Dictionary, by von Burgsdorff (pp. 10–37); The Reorganisation of Poultry and Small Stock Breeding in Germany, by K. Vetter (pp. 38–45); Nutritive Value of Protein Supplements, by J. L. St. John and J. S. Carver (pp. 46–52); The Role of Minerals in Poultry Nutrition, by E. T. Halnan (pp. 53–64); The Importance of the Vitamins in Poultry Feeding, by H. Simonnet (pp. 65–79); The Utilisation of Feeding Material, by E. Mangold (pp. 80–85); Infectious Diseases of Hens and Their Treatment, by H. Miessner and R. Berge (pp. 86–94); Virus Diseases of Chickens, by J. R. Beach (pp. 95–103); The Significance of Poultry Diseases in the Control of Foodstuffs, by K. Beller (pp. 104–109); The Genetics of Some Hereditary Rabbit Diseases Compared With Similar Human Diseases, by H. Nachtsheim

(pp. 110–115); Influence of the Oecological Conditions Upon Italian Poultry-keeping, by A. Vecchi (pp. 116–121); A Comprehensive Breeding Program for the Development of High Laying Strains, by M. A. Jull (pp. 122–129); Keynotes of Progress in Artificial Incubation, by A. L. Romanoff (pp. 130–141); The Effect of Controlled Illumination on the Reproductive Activities of Birds, by W. Rowan (pp. 142–152); and Pregnancy in the Rabbit, by J. Hammond (pp. 153–156).

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38); The Heritable Elements in the Physical Growth of Poultry, by P. Hertwig (pp. 38–41); The Origin of the Difference Between the Size of Fowls, by L. Kaufman (pp. 41–43); Genealogical Tables, by H. F. Krallinger (pp. 43–49); The Hormone Requisites for Growth and Physical Efficiency, by O. Kuhn (pp. 49–51); Sex Determination of Chicks by Colour Reactions, by W. Kupsch (pp. 52–54); New Studies in the Pigmentation and the Markings of Feathers, by G. Montalenti (pp. 54–57); Observations on Embryonic Mortality in Poultry, by A. Murata and S. Katsuki (pp. 58–62); Humidity and the Development of the Turkey Embryo, by F. E. Mussehl and C. W. Ackerson (pp. 63–65); Autosexlinkage in Theory and Practice, by M. Pease (pp. 65–69); Inheritance of Resistance to Bacterial Infection: A Genetic Study of Pullorum Disease, by E. Roberts and L. E. Card (pp. 69–73); Precipitation Test for a Hybrid Between Japanese Long-tailed Fowl and White Leghorn, by K. Sasaki (pp. 73–77); Hatchability Studies With Certain Feeds, by J. B. Smith and H. D. Branion (pp. 77–83); Peroxidases and the Formation of Haemoglobin in the Development of the Domestic Fowl and Domestic Pigeon, by A. Spirito (pp. 83–86); Observations on the Influence of Consanguinity in the Selective Breeding of Poultry, by A. Vecchi (pp. 86–89); How Can the Hatchability of Eggs Be Determined? by C. Voitellier (pp. 89, 90); and Inbreeding in the White Leghorn Fowl, by N. F. Waters and W. V. Lambert (pp. 91–93).

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Breeding in Rumania, by A. Mauch (pp. 257–259); Rabbit Keeping in Great Britain, by J. N. Pickard (pp. 259–261); Quality Tests of Angora Rabbits as Carried on in Germany, by K. Richter (pp. 261–264); Practical Results of a Statistical Calculation Based on 10,000 Rabbit Dissections (With Special Regard to the Results of the Dissection of 2,100 Female Rabbits), by K. Seidel (pp. 264–270); Diseases Peculiar to Rabbits and Their Pathology, by O. Seifried (pp. 271–273); and Breeding Experiments with Rex-furred Rabbits, by W. K. Wilson (pp. 273–276).

Résumés of these papers are in English in volume 3 (English edition).

Commercial poultry farming, T. B. Charles and H. O. Stuart (*Danville, Ill.: Interstate Ptg. Co., 1936, pp. XVI+467, figs. 200*).—It is the object of this book to place at the disposal of poultrymen at large information relative to established and dependable practices in poultry production. Successive chapters deal with incubation, hatchery practices, brooding practices, battery brooding and laying batteries, broiler production, capons and caponizing, principles of feeding, feeding chickens, feeding adult birds, rearing and range management, selection, breeding and sex distinction, trapnesting and pedigreeing, improvement programs, marketing, fattening, housing and appliances, management factors, poultry diseases, and egg formation.

Some aspects of poultry breeding at the Livestock Research Station, Hosur, T. Murari (*Agr. and Livestock in India, 7 (1937), No. 2, pp. 180–187*).—The comparative performances of various imported and native breeds of chickens in the Tropics and at latitude 55° N. are noted. Data are presented on the average egg size, adaptability, and resistance to disease for the various breeds. The results indicate that because of their superior adaptability and disease resistance more attention should be paid to the improvement of indigenous breeds.

Fecundity and reproductive ability in closely confined fowl, S. Bird (*Sci. Agr., 17 (1937), No. 6, pp. 359–375, figs. 3; Fr. abs., p. 375*).—Data are presented on the production records of birds confined to individual cages to show that egg production was equivalent to or better than that of controls and the variability in production was only 75 percent as great. However, fertility and hatchability of fertile eggs were below the controls. Failure to consume sufficient calcium in the form of oyster shells and an excess of phosphorus in the ration are suggested as possible reasons for the low fertility and hatchability.

The relative value of farm grains in poultry nutrition, H. L. Wilcke (*Jour. Amer. Vet. Med. Assoc., 90 (1937), No. 2, pp. 188–193, figs. 2*).—The Iowa Experiment Station has determined the rate of growth of Single Comb White Leghorn chicks reared on rations in which ground yellow corn, ground wheat, or ground whole oats was the sole source of cereal grain, supplements of dried buttermilk, ground oystershell, steamed bonemeal, salt, and cod-liver oil being included in each ration. Oats proved to be the most satisfactory single grain, a ration containing 81.5 percent of oats with the above supplements producing good growth and excellent feathering. A ration containing the same amount of corn with the same supplements was not satisfactory from the standpoint of growth, feathering, or the number of cases of perosis which developed. Wheat in the ration gave results intermediate between those from oats and from corn. Apparently a factor essential for good growth and good feathering was present in oats and to a lesser extent in wheat, but was lacking in corn.

A note on the effect of different cereals in the fattening ration on the composition of the body fat of the fowl, E. M. Cruickshank (*Jour. Agr. Sci. [England], 27 (1937), No. 2, pp. 309–315*).—Three rations in which 12 parts of dried skim milk were mixed with 88 parts of ground oats, corn meal, and

barley meal, respectively, were compared in 12-day fattening trials with both mature and immature Light Sussex cockerels. More rapid gains were secured on the immature lots, and with each age group ground oats promoted most rapid gains and corn the slowest gains. Analysis of body fat showed that the use of either corn or oats had no detrimental effect on the consistency of body fat. When fattening is rapid the type of fat deposited in the bird with corn is harder than that laid down on a normal ration of mixed cereals and protein supplement.

Effect of charcoal and length of storage on the calcifying property of cod liver, sardine (pilchard), and concentrated cod liver oils, L. L. Lachat and H. A. Halvorson (*Poultry Sci., 16 (1937), No. 3, pp. 147–154, fig. 1*).—This describes a series of chick feeding trials in which the effectiveness of various rations tested were measured in terms of growth, percentage of mortality, bone ash content, and the reaction of bone sections to silver nitrate staining. In all cases where fed in combination, three times as much charcoal as oil was used.

In a trial with 9 groups of chicks on the A. O. A. C. rachitic ration in which a poor quality of cod-liver oil was fed at varying levels with and without charcoal, the charcoal exerted no appreciable effect either on the calcifying or growth-promoting properties of the oil. A series of trials was conducted with a basal ration composed of a mixture of 8 commercial feeds typical of commercial chick-growing mashes except that they contained no charcoal or cod-liver oil. Additions of poor quality, good quality, and concentrated cod-liver oils, and sardine (pilchard) oil, each separately and in combination with charcoal, were made to lots of the basal ration, and each was fed to groups of chicks over an 8-week growth period when the ration and supplements were freshly mixed and after 6 months' and 12 months' storage. This basal ration supplemented with charcoal but no vitamin produced subnormal growth and bone calcification. None of the above additions of oils or oil-charcoal mixtures showed any demonstrable effect on the growth-promoting or calcifying properties of the ration, either when newly mixed with it or after the storage periods.

Recent studies of vitamins required by chicks, T. H. Jukes (*Jour. Nutr., 13 (1937), No. 4, pp. 359–387*).—This review covers primarily those investigations dealing with new essential dietary factors and recent reports of quantitative experiments with the older and better known vitamins in poultry nutrition. An extended bibliography is appended.

Further studies on vitamin G in chick nutrition with special reference to flavins, R. M. Bethke, P. R. Record, and O. H. M. Wilder (*Poultry Sci., 16 (1937), No. 3, pp. 175–182, figs. 2*).—In these chick-feeding experiments, reported from the Ohio Experiment Station, a basal experimental ration of yellow corn 58, ground wheat 20, wheat bran 5, Argentine casein 12, steamed bonemeal 3, salt 1, and cod-liver oil 1 was used, mostly for an 8-week feeding period.

When the Argentine casein was replaced by domestic casein, domestic or Argentine casein washed with acidulated water, or purified (Labco) casein, the domestic product gave better growth and less leg disorder than the Argentine product, while the Labco product gave somewhat poorer results. Washing the domestic casein reduced its effectiveness, but had only slight effect on the Argentine product. Adding 3 percent of liver meal or replacing wheat with wheat germ in the basal diet greatly accelerated growth, and wheat middlings proved superior to wheat in the ration.

In a study of the effect of pH control in autoclaving on the growth-promoting and leg disorder factor the autoclaving of dried pork liver or yeast at an acid reaction for 6 hr. at 15–17 lb. pressure did not destroy this factor,

while at an alkaline reaction the factor was totally inactivated in the liver and partially destroyed in the yeast. When dried pork liver was subjected to different concentrations of cold ethyl alcohol, this factor was found to be soluble in 20 percent strength, partially soluble in 70 percent, but insoluble in 95 percent.

Adsorption experiments showed that the factor was adsorbed by fuller's earth from an extract of dried liver or dried whey, indicating that flavines were the principal factor involved. Feeding lactoflavine to chicks which had been on the basal diet for 2 weeks greatly stimulated growth and prevented the onset of the leg disorder. It is concluded that flavines are essential in chick nutrition, and that the beneficial effects from feeding meal, yeast, liver, etc., to poultry are largely due to the flavine content of these products.

Location of the antienzyme in egg white, J. S. Hughes, H. M. Scott, and J. Antelyes (*Indus. and Engin. Chem., Analyt. Ed., 8 (1936), No. 4, pp. 310, 311*).—The Kansas Experiment Station has studied the proteolytic activity of the three fractions of egg white, namely, the outer thin, the thick, and the inner thin portions, by incubating each fraction for 30 min. with a buffered solution of enterokinase. The results clearly indicate that most of the inhibitory substance responsible for the resistance of raw egg white of freshly laid eggs to proteolytic activity is located in the inner thin fraction.

Measurement of the viscosity of eggs by the use of a torsion pendulum, J. V. Atanasoff and H. L. Wilcke (*Jour. Agr. Res.* [*U. S.*], *54 (1937), No. 9, pp. 701–709, figs. 5*).—This report from the Iowa Experiment Station describes a torsion pendulum apparatus used in determining the viscosity of eggs as measured by the effect of placing the egg in the pendulum system on the rate of decrease of the angular amplitude or damping of the system. Equations are presented for calculating the viscosity index value designated as K. A study of the relationship of the K value of 3,890 eggs to the yolk movement and yolk shadow of the eggs as observed by candling showed a correlation coefficient of 0.2388 for the former and 0.2286 for the latter. It is concluded that eggs having a low total viscosity index as measured by the torsion pendulum method are, in general, of poor quality, as judged by yolk movement and yolk shadow, although when individual eggs are studied there is more variation in the results than would be desirable from an experimental standpoint.

The pigment of egg shell membranes, A. A. Klose and H. J. Almquist (*Poultry Sci., 16 (1937), No. 3, pp. 173, 174*).—The California Experiment Station has made a spectroscopic analysis of the pigment extracted from eggshell membrane. It is concluded that this pigment is identical with a natural porphyrin, probably protoporphyrin, which has been identified as the pigment occurring in all pigmented eggshells. The spectra of the membrane pigment and the porphyrin correspond in neutral ether, dilute acid, or dilute alkaline solutions.

Variations in egg-quality characters in certain breeds, varieties, and strains of chickens, A. Van Wagenen, G. O. Hall, and H. S. Wilgus, Jr. (*Jour. Agr. Res.* [*U. S.*], *54 (1937), No. 10, pp. 767–777*).—The [New York] Cornell Experiment Station has made observations on egg quality, including firm albumin score, height of firm albumin, percentage of firm albumin, shell strength, and the presence of abnormalities (meat or blood spots) on 3,043 eggs from 1,273 birds. These included 81 pens of Single Comb White Leghorns, 16 of Barred Plymouth Rocks, 10 of White Plymouth Rocks, 16 of Single Comb Rhode Island Reds, and 10 of New Hampshires entered in New York egg-laying contests. Gross correlations were calculated between the possible pairs of characters for each breed and for the group as a whole. Mathematically significant correlations were found in several instances between the observed condition of the firm albumin and the percentage of firm albumin. The White Leg-

horns showed greater variability between pens than within pens for these characters, indicating strain differences, but this was not evident in the American breeds observed. The percentage of firm albumin and shell strength did not differ importantly for the different breeds except for the Barred Rocks, which showed somewhat weaker shell strength. Meat spots were more prevalent in cases of the American breeds than those of the White Leghorns. None of the egg quality characters observed showed biologically significant interrelations with each other or with production except for the obvious relationship between the height and the condition score of the firm albumin, indicating that the characters used as measures of interior egg quality are independent of each other and are relatively constant for the individual.

Factors influencing production of clean eggs, E. M. Funk (*Missouri Sta. Bul. 384 (1937), pp. 12, figs. 4*).—The information presented is based on observations extending over 15 mo. and including the classification of over 66,000 eggs with respect to cleanliness. Most of the soiling of eggs occurred in the nest, since more than 99 percent of all eggs were clean before they came in contact with the nest. Certain breed differences and also differences between individuals within a breed with respect to percentage of clean eggs produced occurred, evidently associated with the temperament and habits of the individuals. A higher percentage of clean eggs was produced during the hot and dry seasons of the year. The percentage of dirty eggs was reduced approximately 50 percent by gathering eggs four times per day as compared to gathering only at the end of the day, and there was a higher percentage of dirty eggs present in trap nests in the morning than in the afternoon. When open nests were used, darkening the nests materially decreased the percentage of dirty eggs. A higher percentage of clean eggs was gathered from trap nests than from open nests and from birds confined to laying houses than from those on range. Shavings, oat hulls, sawdust, and excelsior were the most effective nesting materials for preventing dirty eggs. Covering the droppings platform with poultry netting and using strips of gravel in front of laying houses did not significantly affect the percentage of clean eggs.

The comparative growth rates of turkeys, ducks, geese, and pheasants, T. T. Milby and E. W. Henderson (*Poultry Sci., 16 (1937), No. 3, pp. 155–165, figs. 10*).—The comparative growth rates of White Pekin ducks, Toulouse geese, Bronze and White Holland turkeys, and ring-necked pheasants have been studied at the Iowa Experiment Station, and the data obtained, along with data from another source, on the growth rate of White Plymouth Rock chickens have been plotted to show the comparative growth curves of the various species. The growth rates of turkeys, chickens, and pheasants were of practically the same magnitude during the first few weeks after hatching, and these species followed the same rates of growth during other periods of constant growth rate, the only marked differences being that each growth period was more prolonged for the turkeys than for the chickens or pheasants. The ducks and geese were very much alike in their rates of growth, but their rate during the first few weeks was practically double that for chickens, etc., while the decline in growth rate was more pronounced and occurred at an earlier age. These results suggested that rapid early growth and quick attainment of the greater proportion of mature weight may be a characteristic of migratory species of fowls.

A contribution to the chemistry of turkey eggs, J. S. Hepburn and P. R. Miraglia (*Jour. Franklin Inst., 223 (1937), No. 3, pp. 375–377*).—Determinations are reported on the moisture, solids, ether extract, crude protein, ash and dextrose composition, and caloric value of the edible portion of six whole turkey eggs and the whites and yolks of five other eggs.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle in Nebraska] (*Nebraska Sta. Rpt.* [*1936*], *pp. 10, 42*).—Results are briefly noted on the vitamin A content of A. I. V., molasses, and ordinary corn silage, and of the milk from cows receiving these various silages as the only roughage; and from the North Platte Substation on pasturing the dairy herd on alfalfa.

[Investigations with dairy cattle and dairy products in Ohio] (*Ohio Sta. Bul. 579* (*1937*), *pp. 73–80, 81–83, fig. 1*).—Brief reports are presented on the use of mineral acids in the preservation of legume silage, by C. C. Hayden, A. E. Perkins, W. E. Krauss, C. F. Monroe, R. G. Washburn, and C. E. Knoop; supplementing pastures for milking cows, and a study of the H-ion concentration of the bovine rumen, both by Perkins and Monroe; a sole roughage ration for raising dairy heifers, and studies on the iodine content of the bovine thyroid, both by Monroe; the effect of feeding menhaden oil on the percentage of butterfat in milk, by T. S. Sutton and Hildreth; the use of hormone preparations in the treatment of certain types of sterility in dairy cows, by Sutton; the effects of vitamin A deficiency on the central nervous system, by Sutton, Setterfield, and Krauss; iron and copper in a normal calf ration, by Knoop, Krauss, Sutton, and Washburn; and bone studies with dairy calves, by Knoop and Krauss.

Studies on the nutritive values of milk yielded information on the growth-promoting value of raw v. pasteurized milk, and of pasture milk v. dry-feed milk, both by Krauss; factors affecting the extent to which milk may be activated by irradiation, by Krauss, R. M. Bethke, and Washburn; technic for assaying vitamin D potency of milk, by Krauss and Bethke; and chemical v. biological assay in determining vitamin C in milk and other materials, by Krauss and Washburn.

Feeding and handling experiments on the Pusa pedigree Sahiwal herd (third report, 1934–35), W. SAYER (*Agr. and Livestock in India*, *7* (*1937*), *No. 2, pp. 145–161, pls. 4, fig. 1*).—Information is presented on the growth, production, and reproduction performance of a Sahiwal dairy herd during the third year of an intensive and carefully controlled program of feeding and management.

The problem of proving dairy bulls, S. TAUSSIG (*Internatl. Rev. Agr., Mo. Bul. Agr. Sci. and Pract.* [*Roma*], *28* (*1937*), *No. 3, pp. 69T–81T, figs. 5*).—This is a comprehensive review of various methods proposed for evaluating dairy bulls.

The influence of sunflower silage upon milk production, C. L. COLE, R. L. DONOVAN, and N. N. ALLEN (*Jour. Dairy Sci.*, *20* (*1937*), *No. 5, pp. 221–230*).—In an experiment conducted at the Minnesota North Central Substation, 14 high grade or purebred Guernsey cows freshening in the fall or early winter were divided into two similar groups. For one complete lactation period one of the groups received 3 lb. of sunflower silage daily per 100 lb. of live weight in addition to an adequate grain ration and all the alfalfa hay they would consume, while a second group received a like grain ration and a full allowance of alfalfa hay but no silage. During the succeeding lactation period these groups were reversed and continued through a second complete lactation. No silage was fed in the barn to either group during the pasture season, both lots having access to the same pasture. Thirteen cows completed the two lactations, and their records are included in the tabulation of data.

Based on the group averages for the two lactations, there was no apparent advantage in milk and butterfat production or in the health or condition of

the cows due to the inclusion of sunflower silage in the ration containing an abundant supply of legume hay and the cows having free access to water. Other studies indicated that under conditions existing in that locality alfalfa hay yielded more total digestible nutrients and a great deal more protein per acre than sunflower silage and could be produced with less than one-half the labor. It is concluded that it appears inadvisable to attempt to provide succulent feed in the dairy ration when conditions are such that it will add materially to the cost of milk production.

Permanent pasture studies, E. C. Elting, J. P. LaMaster, and J. H. Mitchell (*South Carolina Sta. Bul. 308 (1937), pp. 54, figs. 12*).—Two lines of attack were employed in this study.

I. *The grazing value of Bermuda and of carpet grass pastures receiving various fertilizer treatments.*—In this phase of the study, five permanent pasture areas as described were grazed with milking cows and the worth of the pastures expressed in terms of their total digestible nutrient replacement value (alfalfa hay equivalent) based on the total nutrient requirements of the grazing animals for maintenance, live weight change, and milk production minus the nutrients supplied by supplemental feeding. During the course of the trials (1933–35) the average length of the grazing season was slightly under 200 days. The experimental pastures included an untreated Bermuda area, Bermuda pastures receiving ground limestone alone, limestone and superphosphate, and limestone and manure, and a carpet grass pasture receiving a limited amount of superphosphate. The average alfalfa hay equivalent yield per acre for these areas was 2.67, 3.55, 4.14, 4.29, and 2.14 tons, respectively. The average total amount of 4-percent fat-corrected milk produced was 7,405, 9,386, 11,434, 11,125, and 7,107 lb., respectively. The percentage of the total nutrient requirements of the animals supplied by the various pastures was 61, 62.1, 62.6, 63.5, and 48.9, respectively. Complete data on the fertilizer treatments of the pastures, carrying capacities, total milk yields, the amount of nutrients obtained from the pastures, and the net gain in value resulting from the various fertilizer treatments are presented in tabular form. Supplementary information on seasonal variations in the composition of the pasture herbage and the comparative composition of Bermuda and carpet grass are presented graphically.

II. *The effect of various pasture fertilizer treatments on the yields and the composition of Bermuda grass.*—This section of the report deals with the green yield and the composition of Bermuda grass receiving various fertilizer treatments as determined on 46 1/200-acre plats clipped with a lawn mower at regular intervals over four growing seasons, 1929–32, and on 16 additional 1/100-acre plats over the 3-yr. period, 1930–32. The data presented include total green yields and dry matter yields for all plats, and the average composition of the herbage, seasonal trends in rate of growth and composition, and complete mineral analysis from selected plats. Summarizing the results, "rainfall is the most important factor in determining yields. When the rainfall is insufficient, there is little difference between the yields from the various treatments. As indicated by chemical composition, rapidly growing plants produce greater yields and have superior feeding value. The combination of limestone with superphosphate proved to be the most practical treatment made under the conditions of the experiment. The yield and the composition of the pasture herbage were influenced by the frequency of clipping. The results indicate that grazing pastures in such a manner as to permit the accumulation of 2 or 3 weeks' growth is favorable to large yields without adverse changes in the feeding value of the herbage. The feeding value of pasture herbage is lower during the latter part of the growing season because of changes in the chemical composition."

A method for obtaining arterial blood from the goat, W. R. Graham, Jr., C. W. Turner, and E. T. Gomez (*Missouri Sta. Res. Bul. 260 (1937), pp. 15, figs. 11*).—This bulletin describes and illustrates a surgical method by which the carotid artery of the goat may be brought to the surface of the skin for use in the convenient sampling of arterial blood. This technic and one previously noted for obtaining arterial blood samples from cows (E. S. R., 76, p. 530) have been employed in connection with a comparison of arterial and mammary bloods as related to milk secretion.

The nutritive value of raw and pasteurized milk for calves, G. S. Wilson, F. C. Minett, and H. F. Carling (*Jour. Hyg. [London], 37 (1937), No. 2, pp. 243–253, fig. 1*).—This is a report of a calf-feeding experiment conducted in a healthy Shorthorn herd in which alternate calves as they were born were allocated to one of two groups, one of which received raw milk and the other pasteurized milk (145° F. for 30 min.) from 3½ days to 8 weeks of age at the rate of approximately 1 lb. per 10 lb. of live weight daily. The average increase in weight over the 8-week period was 53.72 and 53.86 lb. for the groups fed raw and pasteurized milk, respectively, with nothing in the results to suggest that the nutritive value of pasteurized milk for calves was in any way the inferior.

Proceedings of the twenty-ninth annual convention [of the] International Association of Milk Dealers: Laboratory and production sections (*Internatl. Assoc. Milk Dealers, Proc., 29 (1936), Lab. Sect., pp. 141, figs. 18; Prod. Sect., pp. 105, figs. 3*).—At this meeting held in Atlantic City, N. J., October 12–14, 1936, the following papers were among those presented before the laboratory section: Discussion of *Esch. coli* Test to Determine the Efficiency of Pasteurization, by A. R. M. MacLean (pp. 3–9); The Grading of Raw Milk on the Basis of Bacterial Cleanliness, by G. S. Wilson (pp. 11–20); Factors Affecting the Viscosity of Market Cream, by H. B. Henderson (pp. 21–35); Proposed Changes in Standard Methods Medium and Temperature of Incubation, by A. J. Powers et al. (pp. 38–50); Report of Collaborator on Cooperative Work With Proposed Changes in Medium and Temperature of Incubation, by E. Kelly (pp. 50–75); Comments on Possible Influence of Variations in Laboratory Technique, by J. F. Cone (pp. 75–81); Differential Value of a Milk Medium Containing at Least Two Per Cent of Skim Milk, by C. N. Stark (pp. 82–85); Comparison of Potentiometric and Colorimetric Methods of Determining the Hydrogen Ion Concentration of Nutrient Agar, by J. S. Taylor (pp. 86–93); Sources of Milk Solids for Use in Modified Media, by A. Bradfield (pp. 94–100); Control of the Oxidized Flavor in Milk, by G. R. Greenbank (pp. 101–116); The Cause of Oxidized and Rancid Flavors in Raw Milk, by J. A. Anderson (pp. 117–134); and Flavors of Milk Influenced by Different Systems of Feeding Certain Roughages, by C. L. Roadhouse and J. L. Henderson (pp. 135–141).

The following papers were presented before the production section: Development of the Lactochrometer, by H. H. Tucker (pp. 42–44); Mastitis and Carbohydrate Deficiency, by G. W. Cavanaugh (pp. 45–54); Composition of Milk as Affected by Sub-clinical Mastitis, by A. C. Dahlberg, J. J. Kucera, J. C. Hening, and G. J. Hucker (pp. 54–67); The Significance of Bacterial and Chemical Changes Occurring in Mastitis Milk, by L. A. Burkey, E. B. Meigs, G. P. Sanders, and J. F. Cone (pp. 67–70); Mastitis Detection and Control, by R. B. Little (pp. 71–87); The Presence of Mastitis Streptococci in Bovine Mammary Tissue (Preliminary Report), by G. J. Hucker (pp. 87–92); and Bang's Disease Control, by L. J. Thompkins (pp. 99–105).

Papers and proceedings of the fourteenth annual conference of the New York State Association of Dairy and Milk Inspectors (*N. Y. State Assoc. Dairy and Milk Insp., Ann. Rpt., 10 (1936), pp. 247, pl. 1, figs. 9*).—The following papers, in addition to a number on mastitis noted on page 700, were presented at Schenectady, N. Y., on September 23–25, 1936: An Economic Comparison of Different Methods of Milk Cooling, by H. W. Riley (pp. 21–34); Comparison of Certain Tests Applicable to Raw Milk as Received at Plants, by S. Pincus, S. Abraham, and W. D. Tiedeman (pp. 35–55); The Resazurin Test for the Sanitary Condition of Milk, by G. A. Ramsdell (pp. 57–72); Investigation of the Amylase and Phosphatase Tests as an Indication of Pasteurization, by F. W. Gilcreas and W. S. Davis (pp. 73–94); Desirable Changes in Standard Media and Incubation Temperatures, by R. S. Breed (pp. 107–121); The Use of Skim Milk Agar in Detecting Proteolytic Bacteria Affecting the Quality of Milk, by C. N. Stark (pp. 123–126); Safer Milk and Infant Mortality in Schenectady, by J. H. Collins (pp. 127–129); The Use of Chlorine Solutions on the Dairy Farm, by H. W. Lehmkuhl (pp. 131–152); Vitamin C, Copper, and the Oxidized Flavor of Milk, by P. F. Sharp, G. M. Trout, and E. S. Guthrie (pp. 153–164); Controlling the Flavor of Pasteurized Milk, by H. J. Brueckner (pp. 165–170); and The Survival of *Streptococcus pyogenes* in Cheddar Cheese, by G. J. Hucker and J. C. Marquardt (pp. 171–174).

A study of the alkali-forming bacteria in raw milk [trans. title], W. Storck (*Zentbl. Bakt.* [*etc.*], *2. Abt., 94 (1936), No. 14–18, pp. 295–330, figs. 2*).—This is a report of a systematic study of various bacteria in milk which possess proteolytic properties with an accompanying production of an alkaline reaction. By plating various dilutions of milk in china blue lactose agar and incubating for 48 hr. at 30° C., the alkali-forming organisms were distinguishable by colonies surrounded by a clear area. These organisms were found to belong in order of frequency to the following groups: Micrococci, corynebacteria, mycobacteria, spore formers, streptococci, alcaligenes, fluorescens, proteus, and sarcinae. These organisms in milk may give rise to clotting of the milk through rennet action, to slime formation, and to undesirable flavors and odors. Certain of the groups, including the spore bearers and streptococci, exert lipolytic action, causing rancidity in butter. In some instances their presence in soft cheese may be beneficial, since they are salt resistant, grow at normal ripening temperatures, and cause a slow casein degradation.

Detection and significance of the coliform group in milk, I, II, M. T. Bartram and L. A. Black (*Food Res., 1 (1936), No. 6, pp. 551–563; 2 (1937), No. 1, pp. 21–26*).—A series of studies from the Maryland Experiment Station is reported.

I. *A comparison of media for use in isolation.*—In this phase of the study five liquid and nine solid media were compared with reference to their efficiency in determining the presence of the coliform group of bacteria in milk. Many of the media proved unsatisfactory, certain ones yielding many false presumptive reactions or proving to be quite inhibitive as indicated by the number of positive samples, and none of the media tested were satisfactory in completely inhibiting the growth of organisms other than the coli-aerogenes group. Of the solid media, neutral red bile and violet red bile were the most satisfactory, and 2 percent brilliant green bile was the best liquid media for the isolation of the coliform group from raw, pasteurized, and certified milk. Both of the solid media exceeded the brilliant green bile in accuracy and in number of positive tests obtained, and violet red bile was somewhat better than the neutral red bile in the ease with which coli-aerogenes organisms were recognized. A medium pre-

pared in the Maryland laboratory is described which proved equal to the best of the other media tested. Formate-ricinoleate broth proved superior to eosin-methylene blue plates in the confirmation of positive presumptive tests.

II. *Identification of species isolated.*—A further study was made of the cultures isolated from various milks on different media as noted above. The 310 cultures of the *Escherichia-Aerobacter* group isolated from 331 samples of raw milk consisted of 57 percent *Escherichia*, including 12 species, *E. communior* predominating; 22 percent *Aerobacter* of 5 species with *A. hibernicum* predominating; and 21 percent intermediate of 5 species with *Citrobacter freundii* predominating. Only one of 34 pasteurized milk samples yielded *Escherichia-Aerobacter*. Of 15 cultures studied, one was *Escherichia*, one *Aerobacter*, and 13 intermediate, with *C. decolorans* predominating. Eight cultures were isolated from 25 samples of certified milk, including four *Escherichia*, three *Aerobacter*, and one intermediate. This group of organisms as a whole was more significant than any one genus or species in indicating contamination. No correlation was apparent between the different media used and the genus or species isolated.

The detection and significance of Escherichia-Aerobacter in milk.—III, Correlation of total bacterial count and presence of the coli-aerogenes group, M. T. Bartram and L. A. Black (*Jour. Dairy Sci., 20 (1937), No. 2, pp. 105–112*).—Continuing this study, 331 samples of raw milk, 31 samples of pasteurized milk, and 25 samples of milk meeting the requirements for certified milk were examined for total bacterial count by standard methods, and the coli-aerogenes groups were isolated on both liquid and solid media.

In the case of the raw samples the colon-positive samples showed an average total count 2.9 times that of the colon-negative lot, and less than 10 colon organisms per cubic centimeter were found in 69.2 percent of the samples having a total count of under 10,000 bacteria per cubic centimeter. In pasteurized samples the count of the colon-positive lot averaged 4.3 times higher than for the colon-negative samples, and no pasteurized milk with counts under 1,000 per cubic centimeter contained colon organisms. In no case were colon organisms found in 0.1-cc samples of certified milk. In a few cases where bacterial counts were made on tryptone glucose milk medium at 32° C., 93.5 percent of samples with counts under 10,000 were colon-negative, and counts on colon-positive samples were 12 times higher than on colon-negative samples. These findings are discussed in relation to suitable standards for determining the sanitary qualities of milk.

Streptococcus cremoris, E. S. Yawger, Jr., and J. M. Sherman (*Jour. Dairy Sci., 20 (1937), No. 4, pp. 205–212*).—Studies at the [New York] Cornell Experiment Station of the physiological characteristics of 41 cultures of lactic acid producing streptococci identified as *S. cremoris* and 25 cultures identified as *S. lactis* by methods as described gave definite evidence that these species can be clearly differentiated and that *S. cremoris* is entitled to rank as a separate species. An extensive description of this organism is presented. *S. cremoris* can be separated from *S. lactis* by the inability of the former to produce ammonia in 4 percent peptone and by its inability to grow at 40° C. in the presence of 4 percent sodium chloride and in alkaline broth at pH 9.2. It is also generally less tolerant to methylene blue than *S. lactis*.

A study of oxidized flavor in commercial pasteurized milk, C. T. Roland, C. M. Sorensen, and R. Whitaker (*Jour. Dairy Sci., 20 (1937), No. 4, pp. 213–218*).—The findings relative to the flavor, fat content, and bacterial quality of 139 samples of commercial pasteurized milk from dairies in 19 different cities led to the conclusion that (1) oxidized flavor was the predominating off-

flavor noted and was present in 21 percent of the samples examined, (2) milk having oxidized flavor was generally higher in fat content and lower in bacterial count than milk free from this defect, and (3) premium milks generally high in fat and low in bacterial count had oxidized flavor much more frequently than standard grades of milk which were generally low in fat and of higher bacterial count.

Anti-rachitic cow's milk, W. E. Krauss and R. M. Bethke (*Amer. Assoc. Med. Milk. Comns.* [*etc.*], *Proc., 25–28* (*1932–35*), *pp. 256–259*).—This brief report from the Ohio Experiment Station describes an experiment in which Holstein milk was fortified, either through the feeding of irradiated yeast to cows or by direct ultraviolet irradiation, so that the milk in each case contained approximately 55 Steenbock rat units of vitamin D per quart as assayed by the curative test with rats according to the standard line test procedure. Prophylactic assays of these milks definitely indicated that the fat from the irradiated milk was more potent, 40 mg of fat from this source being equivalent to 60 mg of fat from the yeast milk.

The effect of homogenization at different temperatures on some of the physical properties of milk and cream, R. Whitaker and L. D. Hilker (*Jour. Dairy Sci., 20* (*1937*), *No. 5, pp. 281–287*).—Samples of 4-percent milk and 20-percent cream were homogenized at a pressure of 3,000 lb. per square inch at temperatures of 50°, 60°, 70°, 80°, 90°, 100°, 120°, 145°, and 175° F. Two samples were run at each of the seven lower temperatures, one sample being slowly heated from 40° to homogenization temperature while the other was heated to 145° and then rapidly cooled to homogenization temperature. All samples were pasteurized at 145° for 30 min. immediately after homogenization and aged for 18 hr. at 40° before testing. The results are presented on the effect of these various treatments on average fat globule size, fat globule clumping, cream volume, curd tension, and flavor of the milk samples, and on the average fat globule size, fat globule clumping, viscosity, feathering in hot coffee, skim milk layer, flavor, and color of the cream samples.

It is concluded that the butterfat in milk or cream must be liquid or in a relatively soft condition in order to obtain changes in the above-noted properties by homogenization. It is evident that the condition of butterfat in milk or cream immediately after adjusting to temperatures between 60° and 90° depends upon the temperature treatment of the product prior to its adjustment to these temperatures.

Testing milk and cream, D. H. Nelson (*California Sta. Circ. 340* (*1937*), *pp. 19, figs. 12*).—This circular, which supersedes Circular 230 (E. S. R., 46, p. 578), describes the procedure for conducting the Babcock fat test and the Mann acidity test on milk, skim milk, and cream; specific gravity determinations on milk and skim milk; and sediment tests on milk and cream.

The use of annatto as a denaturing agent in cream (*Maryland Sta. Rpt. 1936, pp. XXIII, XXIV*).—Data on the use of annatto (commercial cheese color) in a concentration of 1:20,000 for denaturing cream are briefly noted.

The oxidation of butterfat, I, II, V. C. Stebnitz and H. H. Sommer (*Jour. Dairy Sci., 20* (*1937*), *Nos. 4, pp. 181–196, figs. 4; 5, pp. 265–280, figs. 4*).—These studies are reported from the Wisconsin Experiment Station.

I. *The catalytic effect of light*.—This phase of the study deals with the oxidation of butterfat in the absence of light, the catalytic effect of various sources of light, and the protective action of various wrappers. Samples of butterfat were subjected to a 200-hr. oxidation period in the dark, being held at 98.5° C. with air constantly bubbling through them. Peroxides were detected after 3 hr. and rose to a maximum at 104 hr., followed by an increase in volatile

acids. Peroxide formation was accompanied by a rapid bleaching of color until at 106 hr. only a trace of yellow color remained. The development of peroxides ordinarily preceded the appearance of tallowy flavor, although tallowy flavor was not always apparent at the same peroxide number. Ultraviolet light and sunlight exerted a very marked catalytic effect on the oxidation of butterfat, while diffused daylight gave a much slower and lamplight a very slow reaction. Infrared light caused no reaction during a 14-hr. exposure. Aluminum foil wrappers prevented the oxidation of butterfat and dark green or dark red transparent wrappers were quite effective in this respect, while other transparent wrappers gave a varying degree of protection, indicating that an effective transparent wrapper must exclude at least ultraviolet light and decrease transmission of the longer rays as much as possible.

II. *The composition of the fat in relation to its susceptibility toward oxidation.*—In this phase of the study the stability toward oxidation of butterfat samples, obtained from various sources, was measured, using an accelerated peroxide test. Other data reported include the color of the fat, refractive index, iodine number, thiocyanogen-iodine number, and the linoleic acid, oleic acid, and saturated fatty acid contents. Butterfat samples from individual cows indicated considerable variation in the stability of the fat toward oxidation from cows of different breeds, from individuals within a breed, and from the same individual at different times. Sufficient numbers were not run to establish definite breed differences, although milk from Holstein cows on winter ration was more susceptible to oxidation than that from the other breeds. Stability of butterfat toward oxidation is inversely related to the unsaturation of the fat, the fat from cows on grass is less saturated than that from cows on winter ration and hence is more susceptible to oxidation, with evidence that the linoleic acid content rather than the oleic acid content governs stability. It appears that the protective substances in milk increase when cows are on grass, thus preventing the development of oxidized flavor in spite of the low stability of the fat toward oxidation. Carotene content is unrelated to stability of the fat.

Yield of Cheddar cheese in relation to the fat percentage in milk, K. Desai and S. Cox (*Agr. and Livestock in India, 7 (1937), No. 2, pp. 162–170, pl. 1*).—In a series of tests with milk ranging in butterfat content from 0.1 to 6.5 percent, it is shown that cheeses made from milk containing from 3.5 to 5 percent fat were the best, both from the standpoint of economy and quality. Under conditions existing in India cheese can be economically manufactured from such milk.

The microbiological flora on the surface of Limburger cheese, C. D. Kelly (*Jour. Dairy Sci., 20 (1937), No. 5, pp. 239–246, figs. 8*).—The New York State Experiment Station has studied the types and relative numbers of organisms found on the surface of Limburger cheese day by day throughout the ripening period, samples being obtained from 14 New York factories. The microbiological changes showed a very definite sequence with advance of the ripening period. Budding yeast cells appeared after 2 or 3 days and were very abundant in from 4 to 5 days, at which stage the surface of the cheese became slimy. Uniform distribution of the organisms in the slime over the surface was accomplished by rubbing the cheeses with the hands. Short slender rods (*Bacterium linens*) appeared about the sixth or seventh day, rapidly increased in numbers, and were uniformly distributed over the surface about the eighth day. Undoubtedly these organisms were responsible for the reddish color which appears on the cheese at this time. The slime on the surface also became heavier or thicker at this stage. Yeast cells decreased in size from the tenth to the eighteenth day and finally disappeared entirely. It is believed that other types of

organisms, while present from time to time, do not have any important part in the ripening of Limburger cheese.

Wrappers for processed cheese, H. L. Templeton and H. H. Sommer (*Jour. Dairy Sci., 20 (1937), No. 5, pp. 231–238*).—The Wisconsin Experiment Station has studied various factors responsible for the discoloration of tinfoil wrappers on processed Cheddar cheese and has also made a comparison of the desirability of a number of wrappers, including commercial tinfoil, aluminum foils coated with certain protective materials to prevent corrosion, a rubber composition film, and a cellulose film. These wrappers were used on cheese samples made up with different emulsifying salts including sodium citrate, disodium phosphate (ortho), and tetrasodium pyrophosphate. The emulsifying salt and the acidity of the cheese are important factors governing tinfoil discoloration. The phosphate salts appear to accelerate the discoloration, especially when the reaction of the cheese-quinhydrone paste is more alkaline than pH 5.8. The metal foils proved superior to the other types of wrappers studied, and the opinion is expressed that for general use with all types of cheese tinfoil is probably more satisfactory than aluminum foil, although with certain types of cheese aluminum foil properly coated may offer distinct advantages.

VETERINARY MEDICINE

Clinical diagnostics of the internal diseases of domestic animals, B. Malkmus, rev. by T. Oppermann, Eng. rev. by J. R. Mohler and A. Eichhorn (*Chicago: Alexander Eger, 1936, 11. ed., Eng. rev., pp. 312, pl. 1, figs. 71*).—This is a revision from the latest English translation and eleventh German edition of the work previously noted (E. S. R., 69, p. 577).

Practical veterinary pharmacology, materia medica, and therapeutics, H. J. Milks (*Chicago: Alexander Eger, 1936, 3. ed., [rev.], pp. XIII+581, [pls. 3], figs. [30]*).—In this third edition (E. S. R., 64, p. 555) the text has been carefully revised and made to conform with the U. S. P. XI. New sections have been added on the treatment of heart worms, the vitamins, and insecticides. The sections on respiratory stimulants, the barbitals—including the more recent and basal injection anesthetics, toxicology of prussic acid, the salicylates, local anesthetics, and preparations of the pituitary body have been largely rewritten. The chapter on biologics has been revised by A. Eichhorn.

Textbook of meat inspection, J. Drabble (*Sydney: Angus & Robertson, 1936; pp. XV+353, figs. 47*).—Three of the 20 chapters of this textbook deal with general pathological conditions, bacterial diseases, and parasites and parasitic diseases, respectively.

Fundamentals of bacteriology, M. Frobisher, Jr. (*Philadelphia and London: W. B. Saunders Co., 1937, pp. 474, figs. 230*).—The first section of this work considers fundamental principles (pp. 17–97); the second section, the class Schizomycetes (pp. 98–259); and the third section, bacteria in relation to disease (pp. 260–455).

The anaerobe bacteria, M. Weinberg, R. Nativelle, and A. R. Prévot (*Les Microbes anaérobies. Paris: Masson & Co., 1937, pp. IV+1186, pls. 10, figs. 161*).—Following a brief preface, the seven parts of this work deal with technic (pp. 1–117); Gram-positive central and subterminal spore pathogenic anaerobes (pp. 119–412); terminal spore anaerobes (pp. 413–515); Gram-positive slightly pathogenic or nonpathogenic anaerobes (pp. 517–655); Gram-negative anaerobes (pp. 657–884); cellulosolytic, pectinolytic, and the *Clostridium butyricum* group of anaerobes (pp. 885–952); and anaerobic cocci (pp. 953–1036). Anaerobic spirochetes of the mouth, bronchi, and lungs (pp. 1037–1042), other anaerobic

microbes (p. 1043), and the habitat of the anaerobes (pp. 1045–1052) are dealt with, and an index of the anaerobes described or mentioned in the volume (pp. 1053–1061), a bibliography arranged by subjects, and a table of contents are included.

Dictionary of the bacteria pathogenic for man, animals, and plants, P. Hauduroy, G. Ehringer, A. Urbain, G. Guillot, and J. Magrou (*Dictionnaire des bactéries pathogènes pour l'homme, les animaux, et les plantes. Paris: Masson & Co., 1937, pp. 597*).—Following a preface and discussion of bacteriological nomenclature, including the international rules of botanical nomenclature by B. P. G. Hochreutiner (pp. 7–19), this work deals with the pathogenic bacteria, the arrangement being alphabetical by genera and species. A brief characterization given of each genus, together with an indication of the type species and the morphology, is followed by the cultural characteristics and biochemical and biological properties of each of the species. A list of the forms recognized as belonging to the genus *Salmonella* (44 in number), their synonymy, and tables showing (1) the important biochemical properties of the forms of *Salmonella*, (2) antigenic constituents of the forms of *Salmonella*, (3) differential reactions of the intestinal pathogens, (4) classical serological reactions of the species of (*a*) *Eberthella* and *Salmonella* and (*b*) *Shigella*, and (5) classification of the streptococci are appended. Five infolded tables summarize the biological characteristics of the genera *Aerobacter*, *Alcaligenes*, *Eberthella*, *Escherichia*, *Proteus*, *Salmonella*, and *Shigella*, and permit of their identification.

[Work in animal pathology and bacteriology at the Maryland Station] (*Maryland Sta. Rpt. 1936, pp. XXIX–XXXII, XLI, XLII*).—Notes are given (E. S. R., 74, p. 694) on the progress of livestock disease projects under way, including blackhead in turkeys (E. S. R., 75, p. 849), so-called "running fits" in dogs, and equine encephalomyelitis. Work on the inheritance of disease resistance in poultry is also referred to.

[Report of animal disease investigations by the Ohio Station] (*Ohio Sta. Bul. 579 (1937), pp. 93–97*).—Work of the year in animal pathology and parasitology referred to (E. S. R., 75, p. 397) includes the results of rapid whole blood pullorum tests in chicks and pseudorabies (mad itch) transmission, both by B. H. Edgington and N. A. Frank; fowl paralysis and parasitic examination of lambs, both by [C. A.] Woodhouse and R. E. Rebrassier; immunity experiments in avian coccidiosis, by Rebrassier and Woodhouse; and crystal violet vaccine for prevention of hog cholera, by Edgington and A. J. Schalk.

Concepts and mechanisms of resistance in helminthic infections, T. W. M. Cameron (*Canad. Jour. Res., 15 (1937), No. 4, Sect. D, pp. 77–90*).—It is pointed out that while the relations that exist between the helminths and their hosts cannot be divided into specific groups, it is desirable that some classification of these relations, together with clear-cut definition of terms, be widely accepted in order that the subject may be discussed intelligently. Thus "a tentative classification is suggested, which distinguishes between (1) compatibility and incompatibility, which refer only to the host environment as it exists before invasion by the parasite; (2) resistance, of various kinds and degrees, which refers to the reaction of the environment to the presence of the helminth; and (3) tolerance and intolerance, which refer to the reaction of the environment to the effects of the helminth."

Modifying the quantitative character of coccidian infection through a dietary factor, E. R. Becker and N. F. Morehouse (*Jour. Parasitol., 23 (1937), No. 2, pp. 153–162*).—Experiments conducted on rats raised in the laboratory and known to have been free from accidental infection up to the date of experi-

mental infection with *Eimeria miyairii* are said to have shown that diet bears a very close relationship to the severity of coccidian infection.

An increase in the proportion of basophilic leucocytes in guinea pigs experimentally infected with swine lungworms, D. A. PORTER (*Jour. Parasitol., 23 (1937), No. 1, pp. 73–82, figs. 3*).—The blood cell reaction of the swine host experimentally infected with lungworms (*Metastrongylus elongatus*) is reported upon, particular attention being called to the marked increase in the percentage of circulating basophilic leucocytes or basophiles in such guinea pigs.

The data presented indicate that the increase in the percentage of basophiles is probably related to the development of the worms in the lungs. Basophiles first appear when the worms reach the lungs, increase in number as the worms develop, and finally return to normal when or after the parasites apparently leave the lungs.

Cysticercosis bovis and its prevention, W. J. and H. B. PENFOLD (*Jour. Helminthol., 15 (1937), No. 1, pp. 37–40*).—This contribution is presented with a view to emphasizing the fact that the economic waste caused by *Taenia saginata* on sewage farms is quite unnecessary, and that cattle can be readily immunized so that there is no human risk of infection from the flesh of such cattle. Large doses, usually 400,000 in number, of fresh eggs of *T. saginata* were given by mouth in immunizing the cattle against *Cysticercus bovis*. Attempts to produce a secondary infection from 54 weeks to 23 mo. after the primary infection by administering large doses of fresh eggs invariably failed, the cattle having become immune.

Studies on the cercaricidal property of the sera of vertebrate animals, M. A. TUBANGUI and V. A. MASILUÑGAN (*Philippine Jour. Sci., 60 (1936), No. 4, pp. 393–398*).—In tests made to determine the cercaricidal property of the serums of different kinds of vertebrates against two species of larval trematodes, namely, the *Schistosoma japonicum* and *Cercaria maitimensis* Tubangui 1928, all of the serums tested, except those of the cat and the rabbit, possessed marked cercaricidal action against the cercaria of *S. japonicum*. With *C. maitimensis*, the effect was only partial.

Resistance to helminth parasites in domestic animals, J. D. MIZELLE (*Vet. Med., 32 (1937), No. 4, pp. 168–170*).—This contribution is presented with a list of several references to the literature.

A further note on the incidence of anthrax in stock in Australia, M. HENRY (*Austral. Vet. Jour., 12 (1936), No. 6, pp. 235–239*).—This contribution supplements the earlier account (E. S. R., 53, p. 279).

A new disease of veld rodents: "Tiger River disease", J. H. HARVEY PIRIE (*So. African Inst. Med. Res. Pubs., No. 20 (1927), pp. 163–186, pls. 2*).—The name *Listerella hepatolytica* n. g. and sp. is proposed for the causative organism (a Gram-positive motile bacillus) of an undescribed fatal bacterial disease of the gerbil (*Tatera lobengulae*), a small ratlike animal which burrows in the ground in the Tiger River district of the Union of South Africa. "Experimentally, this organism has been found to be highly pathogenic for all the small veld rodents tested and also for house mice. For rats, guinea pigs, rabbits, and the larger veld rodents its pathogenicity is less or nil. For cats, dogs, and monkeys it is nonpathogenic. Infection can be produced by subcutaneous inoculation or by feeding, and it is thought that it is by feeding that the disease is spread in nature. The chief lesions produced by the organism are intestinal ulceration (when infection is by feeding), necrosis of the liver and spleen, and bacteremia."

Pathogenic organisms of the genus Listerella, C. V. SEASTONE (*Jour. Expt. Med., 62 (1935), No. 2, pp. 203–212, pls. 2, figs. 2*).—The cultural and serological

properties of closely related Gram-positive organisms that have been isolated by different observers from meningitis in man, encephalitis in cattle and sheep, a myocardial infection in fowl, and a general infection in rabbits, and apparently belong to the genus *Listerella*, are described. When injected intravenously into chickens, rabbits, or guinea pigs there is an unusual blood response, the monocytes being markedly increased. The organisms tend to localize in the myocardium with resulting necrosis.

Ovine encephalomyelitis associated with Listerella infection, E. JUNGHERR (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 1, pp. 73–87, figs. 8*).—The loss of several of the best animals in a flock of some 200 purebred sheep maintained for teaching and demonstration purposes at the Connecticut State College from an affection characterized by cerebral symptoms led to the investigation at the [Connecticut] Storrs Experiment Station here reported. Following the discovery of distinctive histologic lesions in the brain of these cases, an organism of the genus *Listerella* was isolated which was capable of producing a pathologic picture in experimentally injected animals that resembled the original. It is pointed out that similar cases in sheep have been reported by Seastone in the United States, as above noted, and by Gill in New Zealand under the name of circling disease as noted below.

"Pathologically the disease was characterized by affecting well-nourished mature animals of both sexes, by normal differential leucocyte count of the blood, slight parenchymatous and fatty changes in the liver, and centrally located polynuclear foci and monocytic perivascular and meningeal infiltration in the medulla oblongata. Disturbances similar to those observed in the sheep were produced in mice by intranasal injection of brain suspensions and of small doses of culture after an incubation period of about 2 weeks. Filtered brain material was innocuous, while large doses of culture administered by the same route produced a rapidly fatal septicemia and meningitis. Sheep infected with the cultured organism by intranasal or conjunctival application showed a marked thermic and agglutinative response and recovered. A similar but slighter reaction was observed in a control animal kept in the same pen. Intracarotid injection of sheep caused death from hemorrhagic meningitis within 48 hr.

"Two ovine *Listerella* strains isolated from the outbreak were found to be indistinguishable by cultural, agglutination, and agglutinin-absorption tests from one ovine and two human stock strains. Although the pathogenesis of the ovine disease is not entirely understood, it appears that the *Listerella* genus plays an important role as an etiological agent."

Ovine bacterial encephalitis (circling disease) and the bacterial genus Listerella, D. A. GILL (*Austral. Vet. Jour., 13 (1937), No. 2, pp. 46–56, fig. 1*).—A further study (E. S. R., 69, p. 858) of the small Gram-positive organism commonly found by histological examination in the lesions of the midbrain of affected sheep, known locally in New Zealand as circling disease, has resulted in placing it in the genus *Listerella*, erected by Pirie in 1927 (see p. 696). The name *L. ovis* is suggested. It appears that the organisms of this genus have a wide range of pathogenicity, having already been found responsible for mortalities in rabbits, guinea pigs, gerbils, fowls, sheep, cattle, and man.

The treatment of piroplasmosis (P. bigeminum) with akiron, J. LEGG (*Austral. Vet. Jour., 12 (1936), No. 6, pp. 227–230*).—Doses of 4–5 cc of a 5-percent solution of akiron (an N,-N′ (bis-methyl-chinolylium-methysulfate-6) compound with urea), when given intravenously to cattle reacting acutely to *Piroplasma bigeminum* have been found to be followed by a rapid reduction in the number of parasites, a fall of temperature, and recovery of the animals. Animals so treated may rapidly lose their infectivity and thereby become again susceptible

to subsequent infection. The problem of determining a dose suitable for the avoidance of undesirable results in premunization, i. e., complete destruction of the blood parasites, remains for subsequent investigation.

Rinderpest studies, M. M. ROBLES (*Philippine Jour. Sci., 60 (1936), No. 4, pp. 361–385, figs. 15*).—This contribution considers antirinderpest immune and hyperimmune serums, the serum of vaccinated animals and the effect of virus on its potency, and the spleen and lymph glands of rinderpest-recovered animals for immunization. A list is given of 20 references to the literature.

Immunity in rinderpest-vaccinated animals, T. TOPACIO and M. M. ROBLES (*Philippine Jour. Sci., 60 (1936), No. 4, pp. 387–392*).—Experimental evidence was obtained to show that the lymph glands of rinderpest-vaccinated cattle and carabaos possess the ability of neutralizing the rinderpest virus in vivo. It is pointed out that this may be taken as a measure of the degree of general immunity produced in the animal body.

Alum-toxoid as a vaccine for the prevention of tetanus in animals, D. T. OXER, C. W. ADEY, and M. KENNEDY (*Austral. Vet. Jour., 12 (1936), No. 6, pp. 221–225*).—The injection of alum-precipitated tetanus toxoid into a total of 30 horses caused a local edema of considerable size. This disappeared in about 4 days, giving place to a small firm swelling which might take some weeks, or even months, completely to resolve. One injection of 0.1 cc alum toxoid prepared from a toxin containing approximately 40,000 guinea pig m. l. d. per cubic centimeter protected guinea pigs against at least 30 m. l. d. of tetanus toxin. One dose of the same alum toxoid injected into a group of 20 horses stimulated a high antitoxic response. When 5 of these 20 vaccinated horses, together with 5 unvaccinated controls, were subjected to injection of toxin-free tetanus spores and calcium chloride solution, the vaccinated horses remained unaffected. Three of the controls developed tetanus and were destroyed.

A histological study of bovine udder parenchyma, G. C. HOLM (*Vet. Med., 32 (1937), No. 4, pp. 163–167, figs. 8*).—This contribution is presented with a list of 22 references to the literature.

The significance of suspicious agglutination reactions for Bang's disease, C. P. FITCH, L. M. BISHOP, and W. L. BOYD (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 1, pp. 22–47*).—Some of the past and present policies in regard to the diagnosis of Bang's disease in cattle the reactions of which are in the lower dilutions of the agglutination test, are first reviewed in this contribution from the Minnesota Experiment Station. A discussion of reactions in low dilutions due to ascending titers and to descending titers, and reactions in low dilutions only, is followed by a report of experimental work, presented at length in tables.

During the course of this work three individuals from the suspicious groups of animals became positive to the agglutination test. "Two of them aborted, and *Brucella abortus* was isolated from the placenta and colostrum. Two had been previous reactors, with titers above 1:100. The other individual gave a maximum titer of an incomplete at 1:100 approximately 1 yr. before she showed a higher titer and aborted. All three gave definite evidence by the blood test of infection in ample time to be removed from the herd before any of them aborted. *B. abortus* was not isolated by any bacteriological examination made of suspicious animals in the herd. None of the control animals have become infected, although some of them have developed titers of 1:50 and at times 1:100."

The study is considered to have shown that it is possible, through careful selection and study, to arrive at a reasonably accurate diagnosis and disposition of particular individuals showing suspicious reactions to Bang's disease.

"A definite rule for the disposition of all animals having suspicious titers for Bang's disease on a single test is impossible. It is necessary to have the results of a series of tests over a considerable period of time and information on the duration of pregnancy along with an adequate herd history in order that the proper deductions can be made. The results so far obtained show conclusively that most animals having a constant suspicious titer for Bang's disease are not dangerous and will not spread Bang infection in an otherwise clean herd."

The contribution is accompanied by a list of 44 references to the literature.

The double intradermal test (Holthum's technique) as an additional aid in the diagnosis of contagious abortion, T. LE Q. BLAMPIED and A. A. MACKAY (*Vet. Jour., 93 (1937), No. 5, pp. 178–188*).—In the tests made, the details of which are presented in seven tables, the double intradermal test for infectious abortion was found to be of exceptional value in the eradication of the disease from a herd containing individuals whose serum furnished an indefinite reaction to the agglutination test.

The effects of exposure to different degrees of temperature on the etiological agents of bovine anaplasmosis and piroplasmosis, C. W. REES (*Jour. Parasitol., 23 (1937), No. 2, pp. 175–182*).—It was found in the course of immunization experiments with anaplasmosis that *Anaplasma marginale* was not killed by exposure for 18 hr. at −78.6° C. and subsequent thawing at room temperature. The incubation period was lengthened but the virulence of the organism was not otherwise reduced. "None of five bulls was immunized as a result of one or more injections of red blood cells in which the etiological agent of anaplasmosis was killed by heat, whether this agent was present alone or mixed with the killed agents of piroplasmosis. All of the bulls contracted fatal infection of anaplasmosis when subsequently injected with the living agent. In heavily infected red blood cells from a clinical case of anaplasmosis, some of the etiological agent of this disease survived in vitro for about 20 min. during which the temperature of the cells was being raised from about 25° to 60°. In all other tests this agent was killed at 60° and also at 57° and 54°. In two tests it survived at 50°; in two tests it was killed at 48°, but in three tests it survived at 48°. In one case of survival at 60° the etiological agent of anaplasmosis showed loss of virulence; in all cases of survival at temperatures lower than 60° the incubation period was lengthened but the virulence was not otherwise reduced. In one case, after an incubation period of 36 days, anaplasmosis was transmitted by cells drawn from the 'donor' during the incubation period and heated at 48° for 15 min.

"*Babesia argentina* and *B. bigemina* were killed in cells heated 10 min. in a bath at 48°, and *B. bigemina* at all temperatures higher than 48°; they both survived at 45°. The differential between the thermal death points of the etiological agents of anaplasmosis and piroplasmosis has furnished the basis of a practicable method of separating the two infections. The virulence of *B. bigemina* was greatly reduced by heating for 15 min. at 45°."

Cross-immunity tests between Anaplasma centrale (South Africa) and Anaplasma marginale (Australia), J. LEGG (*Austral. Vet. Jour., 12 (1936), No. 6, pp. 230–233*).—In the experiments reported it was found that while Australian cattle react fairly severely to *A. centrale* (South Africa) infection no fatalities occurred and the animals rapidly recovered. The individual resistance of *A. centrale* carriers to *A. marginale* (Australia) infection varies. Generally speaking, it is high. When cattle are premunized by inoculation with *Piroplasma bigeminum* and *A. centrale*, no untoward effects have followed their transfer from clean country to tick-infested pastures.

[Contributions on bovine mastitis] (*N. Y. State Assoc. Dairy and Milk Insp., Ann. Rpt., 10 (1936), pp. 95, 97, 98, 100–102, 104, 195–211, 213–236, figs. 2*).—The contributions on bovine mastitis presented at the fourteenth annual conference of the New York State Association of Dairy and Milk Inspectors held in Schenectady in September 1936 are as follows: Hemolytic Streptococci in Milk, by J. M. Sherman (pp. 95, 97, 98, 100–102); Composition of Milk as Affected by Subclinical Mastitis, by A. C. Dahlberg, J. J. Kucera, J. C. Hening, and G. J. Hucker (pp. 195–204), and The Significance of the Cell Count in Milk, part 1 by R. S. Breed (pp. 205–211) and part 2 by G. J. Hucker (pp. 213–220), both contributed from the New York State Experiment Station; The Pathological Changes in the Udders of Cows With Marked Physical Cases of Mastitis, by W. T. Miller (pp. 221–226); and How Mastitis Has Been Controlled in New York State Dairy Herds, by D. H. Udall (pp. 227–233).

Subcutaneous and cutaneous lesions in cattle which sometimes cause hypersensitiveness to tuberculin (so-called "skin tuberculosis"), G. B. Brook (*Vet. Jour., 93 (1937), No. 4, pp. 135–141, pl. 1, fig. 1*).—Following a brief introduction, presenting the clinical picture and the macroscopic and microscopic appearance, the incidence and distribution of the affection are considered.

Entero-toxaemic jaundice of sheep and cattle.—A preliminary report on the aetiology of the disease, A. L. Rose and G. Edgar (*Austral. Vet. Jour., 12 (1936), No. 6, pp. 212–220, figs. 2*).—A brief description is given of a fatal disease of sheep and cattle, associated with hemoglobinemia and hemoglobinuria, of which an intense icterus is the outstanding characteristic. "A hemolytic toxic bowel filtrate has been recovered from cases in both sheep and cattle. An organism morphologically and culturally resembling *Cl[ostridium] welchii* is readily cultivable from the small intestines of cases of the disease in both sheep and cattle. These organisms evince hemolysis when suitably incubated on blood agar plates. *C. welchii*, type A, antiserum protected mice against lethal doses of whole culture and type D antiserum did not. Calves protected with *C. welchii*, type A, antiserum were effectively protected against natural infection, control animals dying of the disease. . . . It is considered that there is sufficient evidence on which to base the opinion that the disease under investigation is an enterotoxemia with *C. welchii*, type A, as the pathogen. In view of this and on account of the associated icterus, we propose the name of enterotoxemic jaundice for the disease."

Summary of sheep diseases, E. T. Baker (*Vet. Med., 32 (1937), No. 6, pp. 295–300*).—Replies received from the State veterinarian or other representative in the United States, Hawaii, and Canada regarding the sheep diseases of importance are presented.

Alum-vaccine as an antigen for the prophylactic immunization of sheep against black disease, D. T. Oxer (*Austral. Vet. Jour., 13 (1937), No. 1, pp. 3–15, fig. 1*).—A description is given of a rapid test that has been developed for the determination of the antigenic value of *Clostridium oedematiens* toxoid.

"The conditions required to effect maximum precipitation of toxoid by means of potash alum, with minimum volume of resultant precipitate, were found to be a concentration of 2 percent, a pH value of 6.5 to 7.8, and an initial temperature of 37° C. The antitoxic response, in guinea pigs, to standard *C. oedematiens* vaccine (anaculture) was greater when the quantity was administered as two doses than when it was given as one dose. Half the quantity of vaccine, together with 2 percent potash alum, given as one dose, was more effective than the quantity of vaccine alone given as two doses. Vaccination experiments in groups of sheep confirmed the results obtained in guinea pigs in demonstrating the superiority of alum-precipitated vaccine.

The latter stimulated a response which was not only much greater but was also sustained at a much higher level than that following the use either of one or two doses of stock vaccine."

The production of artificial immunity against hydatid disease in sheep, E. L. TURNER, E. W. DENNIS, and D. A. BERBERIAN (*Jour. Parasitol., 23 (1937), No. 1, pp. 43–61, figs. 16*).—This contribution deals with the experimental immunization of sheep against the larval stage of *Echinococcus granulosus*. The antigen employed was prepared from viable scolices and germinating membrane from fertile cysts of the lungs and livers of both sheep and cattle. Following the completion of the injections of antigen, intervals of from 21 to 170 days were allowed before attempts were made to infect the animals. It was found that the immunizing procedure did not prevent infection. Immunization reduced the number of cysts, as compared with controls, only in certain experiments. There were no significant differences in antibody content of immunized and control sheep under the stimulus of infection. In all experiments immunized animals have shown marked ability to defend themselves against the growth of the parasites by a rapid and highly efficient walling off of the invaders. The greatly thickened adventitia and thorough calcification of the wall of the hydatid cyst at an early period produce an efficient and eventually impermeable mechanical barrier, leading to death of the parasite as the result of starvation and the accumulation of toxic metabolites.

A list is given of 32 references to the literature.

On the incidence of abomasal parasites in fat lambs from the same flock, A. H. H. FRASER and D. ROBERTSON (*Jour. Helminthol., 15 (1937), No. 1, pp. 53–60*).—The authors found that a lamb slaughtered fat before or shortly after weaning and presumably healthy may contain up to 2,100 *Haemonchus contortus* and up to 4,670 *Ostertagia circumcincta*. Infestation with the former is negligible until August, but with the latter infestation remains almost steady from early May until mid-September. Infestation with *Trichostrongylus axei* occurs from May until mid-September but is never very heavy. The evidence obtained suggests, but does not prove, that in midsummer there is a wide difference in the infestation of single and twin lambs. It is pointed out that while the results obtained, so far as they relate to the seasonality of infestation, apply only to the flock of the Duthie Experimental Stock Farm, they are probably true for the northeast area of Scotland.

Diseases of the joints of swine, H. C. H. KERNKAMP (*Vet. Med., 32 (1937), No. 3, pp. 108–111, figs. 2*).—A practical account.

Porcine brucellosis, F. M. HAYES (*Vet. Med., 32 (1937), No. 3, pp. 112–116, figs. 5*).—A practical account.

Strangles in hogs, I. E. NEWSOM (*Vet. Med., 32 (1937), No. 3, pp. 137, 138, figs. 2*).—In this contribution from the Colorado Experiment Station a brief report is made of a condition that developed in a lot of 30 hogs at Julesburg, Colo., characterized by abscesses in the region of the throat and found to be due to a hemolytic streptococcal infection.

The effect of feeding paradichlorobenzene-treated corn to swine, M. W. EMMEL and W. W. HENLEY (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 1, pp. 59–63*).—In experiments conducted at the Florida Experiment Station it was found that the meat of pigs which had been fed for 15 days upon paradichlorobenzene-treated corn was distasteful and unfit for food. "The length of time required for the meat to become edible after a 15-day period on treated corn was approximately 62 days. After a 28-day period on treated corn this period was approximately 85 days. Cloudy swelling of the heart, kidney, and liver was the

only macroscopic lesion observed. Microscopic lesions consisted chiefly of cloudy swelling in all of the parenchymatous organs and involuntary muscle."

Transmission of the virus of equine encephalomyelitis by Aedes taeniorhynchus, R. A. Kelser (*Science, 85 (1937), No. 2198, p. 178*).—Studies conducted in the Canal Zone are said to have proved definitely that *A. taeniorhynchus* can transmit the western type of equine encephalomyelitis from guinea pig to guinea pig. Tests of the transmission of the eastern type of the virus by the mosquito have thus far proved vain.

Losses of undetermined cause following an outbreak of equine encephalomyelitis, H. Marsh (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 1, pp. 88–93*).—The author has been led to conclude that the acute and fatal disease which occurred following the 1936 epidemic of equine encephalomyelitis in Montana was probably not simply a second outbreak of the disease in horses in which no permanent immunity had been established, since it has been impossible to recover the virus of encephalomyelitis from these cases or to demonstrate the lesions in the central nervous system.

Etiology of kumri.—A preliminary note, P. G. Malkani (*Indian Vet. Jour., 10 (1933), No. 1, pp. 6–19, pls. 4*).—Kumri is a serious chronic disease of horses characterized chiefly by loss of strength in the hind legs and defective coordination between the various groups of muscles, which is prevalent in India, China, and the Federated Malay States and is most common in imported horses. The Indian breeds are relatively resistant. The schistosomiasis theory is considered the most plausible, since it explains all the known features of the disease.

"Kumri".—Second progress report, P. G. Malkani (*Indian Jour. Vet. Sci. and Anim. Husb., 7 (1937), No. 1, pp. 1–7*).—Kumri is considered a definite morbid entity since the majority of affected animals present a uniform symptom complex. Schistosomes have been found present in numbers in the liver of every case.

Experimental studies on the curative treatment of surra in native horses in the Philippines, II, L. M. Yutuc (*Philippine Jour. Sci., 61 (1936), No. 4, pp. 401–414*).—This continuation of the contribution previously noted (E. S. R., 72, p. 535) reports upon experiments aimed at the determination of the value of the simultaneous intrathecal and intravenous injections of naganol and the combination of etharsanol and naganol treatment in relapsed animals.

"Of the seven horses employed in the intrathecal-intravenous method, four were able to stand the complete course of the treatment with the exception of one which received only two injections, but all four relapsed. Of the remaining animals two died in the course of the treatment and one was killed in extremis at the end of the post treatment observation period covering 24 days. In view of the above, the intrathecal-intravenous injections of naganol as a treatment of experimental surra in Philippine horses was found to be of not much value and to some extent attended with danger.

"The three animals subjected to the etharsanol-naganol treatment recovered. In declaring these cases recovered, animal inoculation, complement-fixation test, duration of post treatment observation, microscopic examination of the blood, increase in weight, and good condition of the animals were considered."

[Contributions on diseases and parasites of poultry] (In *Wissenschaftliche Berichte des VI. Weltgeflügelkongresses, 1936. Leipzig: Reichsmin. Ernähr. u. Landw., 1936, vols. 1, pp. 1–9, 86–115, figs. 7; 2, pp. 94–182, 271–273, figs. 2; 3, Eng., Ger., Fr., Ital., Span. abs. pp. 63–66, 88–99, 349–447, 522–524; Eng. Summaries, pp. 1, 2, 7–10, 63–78, 93*).—Contributions relating to diseases and parasites presented at the Sixth World's Poultry Congress (E. S. R., 73, p. 246), held at Berlin and Leipzig, July 24 to August 2, 1936, include the following:

Vol. 1.—International Efforts and Prescriptions of Veterinary Police in Relation to Infectious Poultry Diseases, by H. C. L. E. Berger (pp. 1–9); Infectious Diseases of Hens and Their Treatment, by H. Miessner and R. Berge (pp. 86–94); Virus Diseases of Chickens, by J. R. Beach (pp. 95–103); The Significance of Poultry Diseases in the Control of Foodstuffs, by K. Beller (pp. 104–109); and The Genetics of Some Hereditary Rabbit-Diseases Compared With Similar Human Diseases, by H. Nachtsheim (pp. 110–115).

Vol. 2.—The Occurrence of Poultry Enteritis in Turkey [Anatolia], by S. T. Aygün (pp. 94–96); Observations Concerning the Advisability and Possibility of Isolation Methods in Poultry Raising as Aiding in the Prevention of the Spread of Contagious Diseases, by Baratte (pp. 96, 97); Researches on Etiology and Occurrence of Paralysis in Poultry in Austria, by R. Baumann (pp. 98, 99); Epidemic Tremors (Trembling Chick Disease), by C. A. Bottorff, A. E. Tepper, C. L. Martin, T. B. Charles, F. D. Reed, R. C. Bradley, T. G. Phillips, and S. R. Shimer (pp. 99–103), contributed from the New Hampshire Experiment Station (E. S. R., 76, p. 854); Livability Results in Chicks From Flocks Tested for Pullorum Disease by the Standard Tube Agglutination Method, by J. T. Burriss and E. W. Roberts (pp. 104–108); Observations on Fowl Paralysis (Lymphomatosis), by T. Dalling and G. H. Warrack (pp. 108–114) (E. S. R., 76, p. 854); Marek's Chicken Paralysis (Neurolymphomatosis), by J. Dobberstein (pp. 114–116); Practical Experiences in Combating Chicken Paralysis, by K. Fritzsche (pp. 116–118); The Importance of Paralysis and Leucosis in Poultry Raising, by L. Geurden (pp. 118–122); Treatment of Contagious Pip in Fowls With Argyrol, by E. A. Gutiérrez (p. 122); Poultry Tuberculosis, Its Prophylaxis and B. C. G. Experiments for Rendering Poultry and Pigeons Immune, by R. Harnach (pp. 123–125); The Importance of Veterinary Sanitary Control of Poultry-Breeding Establishments for Combating the Most Important Diseases, by H. Hartwigk (pp. 125–128); Observations on Combating Diseases of Poultry in Holland, by B. J. C. te Hennepe (pp. 128–132); The Occurrence of Harmful Bacteria in Foodstuffs Caused by Poultry and Poultry Products, by [M.] Lerche (pp. 132–136); Paratyphoid of Pigeons, by G. Lesbouyries (pp. 136–138); Recent Advances in Research on Poultry Diseases, by C. A. McGaughey (pp. 138–141); New Experiences With Fowl Cholera, by R. Manninger (pp. 141–146); Lack of Vitamins and Infections: A Disease of Ducks With Symptoms of Both Conditions, by C. Arroyo Martín and R. Campos Onetti (pp. 146–149); The Infectious Laryngotracheal Bronchitis of Fowls in Spain, by C. Arroyo Martín (pp. 150–155); Studies of Perosis in Chicks, by H. I. Milne (pp. 155–158); A Few Experimental Hints on Vaccination Against Laryngotracheitis, by N. Nakamura (pp. 158, 159); The Effects on Poultry of Certain Substances Commonly Employed for Therapeutic or Prophylactic Purposes or Used in Agriculture for the Combating of Injurious Insects, by A. Scaccini (pp. 159–162); Enteritis Infection in Fowls (Paratyphosis, Salmonellosis), by J. Schaaf (pp. 162–166); Poultry Paralysis and Diseases Due to Improper Feeding, by O. Seifried (pp. 166–169); Brachylaemi as the Cause of Hemorrhagic Appendicitis Among Poultry, by C. Sprehn and U. Maskar (pp. 169–172); The Importance of Bacillaemia Occurring With Tuberculosis of Chickens, by V. C. Tomescu (pp. 173–175); Notes on Poultry Tuberculosis in Lombardy, by G. Vianello (pp. 175–177); Investigation of the Intermediate Host of the Poultry Tape Worm as Found in Germany, by R. Wetzel (pp. 177–180); The Immunogenetic Value of the Cultural Forms of *Pasteurella avicida*, by V. Wynohradnyk (pp. 180–182); and Diseases Peculiar to Rabbits and Their Pathology, by O. Seifried (pp. 271–273).

[Work in avian pathology] (*Nulaid News, 14 (1937), No. 11, pp. 45, 46, 63*).—The work of 1936 in the poultry pathological laboratories, California State Department of Agriculture, is reported upon by H. A. Hoffman and E. E. Jones.

Filterable virus diseases of fowls, C. A. BRANDLY (*Vet. Med., 32 (1937), No. 4, pp. 180–182, fig. 1*).—A summary of information, particularly on the pathogenic effect and differential diagnosis of leukemia and fowl pox, with control measures.

On some lesions associated with helminths in birds of economic importance, P. A. CLAPHAM (*Jour. Helminthol., 15 (1937), No. 1, pp. 49–52*).—A report of studies conducted at the Institute of Agricultural Parasitology at St. Albans, England.

Infectious bronchitis, F. R. BEAUDETTE (*Iowa Poultry Impr. Assoc. Yearbook, 5 (1937), pp. 99, 101, 102*).—A practical summary on infectious bronchitis, a new respiratory disease previously noted (E. S. R., 76, p. 696), contributed from the New Jersey Experiment Stations.

Infectious laryngotracheitis, F. R. BEAUDETTE (*Poultry Sci., 16 (1937), No. 2, pp. 103–105*).—A practical review of the status of knowledge of infectious laryngotracheitis, contributed from the New Jersey Experiment Stations.

Observations and experiments with neurolymphomatosis and the leukotic diseases, C. S. GIBBS (*Massachusetts Sta. Bull. 337 (1936), pp. 31, figs. 6*).—In reporting upon an investigation of the methods of transmission of neurolymphomatosis through the egg and of leucotic diseases by means of viruses, erythroleucosis, myeloleucosis, monoleucosis, and lympholeucosis are first dealt with (pp. 2–9). It appears that erythroleucosis and myeloleucosis are filtrable virus diseases, the filtrable agents being contained in the blood stream independent of the cellular elements. "Chickens under a year old are more susceptible than older birds. Predisposing factors appear to be mites [the chicken mite], warm weather, and overcrowding.

"An outbreak of monoleucosis is reported as distinct from erythroleucosis and myeloleucosis.

"Lympholeucosis is due to a histogenous cell identified by the vesicular arrangement of the chromatin of the nucleus. It is usually found infiltrating the tissues of the liver and spleen, and free in the portal blood of affected chickens. The living lympholeucotic cell is resistant to vital strains such as trypan blue, but the dead cell readily absorbs trypan blue. Lympholeucosis was transmitted from diseased to healthy chickens by inoculating portal blood containing large numbers of the living cells directly into the blood stream or the abdominal cavity.

"Neurolymphomatosis, or avian paralysis, is due to a histogenous cell indistinguishable from that occurring in lmypholeucosis, except that it has a special predilection for the nervous system, and, under conditions not very well understood, it may invade other adjacent tissues. Chickens inoculated in the nervous system with living cells developed neurolymphomas distally to the point of inoculation in the nerves of the limbs.

"The evidence indicates that the neurolymphomatous cell was transmitted from the hen and possibly from the rooster to the chicken through the egg. The exact method by which the egg is affected was not determined, although neurolymphomatous cells were found infiltrating ovules in affected hens, and cells indistinguishable from them were found in the semen of affected roosters and the follicular fluid of diseased hens. The ovaries and testes of active transmitters were found at necropsy to be infiltrated with neurolymphomatous cells, and no hen or rooster was incriminated in this study as a transmitter that did not show such infiltration of the reproductive organs at some time.

"Symptoms appeared in affected chickens in from 2 weeks to 10 mo. The average period for the 66 birds in this study was 188.85 days, or about 6 mo.

"During the course of these observations and experiments, evidence was secured which indicates that hereditary factors involving resistant and susceptible birds were found in certain forms of neurolymphomatosis, particularly in the infiltration of the ovules of the ovary and the nerve of the eye.

"In conclusion it should be pointed out that the experiments reported in this bulletin were directed toward a study of those forms of neurolymphomatosis which affect the ovary and testes, and of the methods whereby the disease is transmitted through the egg. Transmission through the egg, however, may not be the only way or even the most important way in which the disease is spread."

Salmonella infections in chickens, H. Van Roekel and K. L. Bullis (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 1, pp. 48–58*).—In this contribution from the Massachusetts Experiment Station, which relates particularly to *S. pullorum* infections and is based upon work previously noted (E. S. R., 76, p. 107), data are presented which show that pullorum disease, fowl typhoid, and possibly other *Salmonella* infections can be eradicated from flocks.

An examination of sixty-four strains of Salmonella sp. isolated from poultry in New South Wales, L. Hart (*Austral. Vet. Jour., 12 (1936), No. 6, pp. 233–235*).—All recoveries during the past 3 yr. from poultry in New South Wales were found to conform to the reaction of *S. pullorum*. Since the strains came from the main poultry-raising districts of the State there is no reason to suspect that *S. gallinarum* infection occurs in New South Wales.

Toxins of Salmonella aertrycke, R. C. Hebter and L. F. Rettger (*Jour. Immunol., 32 (1937), No. 5, pp. 357–374*).—The authors have found that the virulent strains of *S. aertrycke* isolated during recent paratyphoid epizootics in turkeys, as reported upon by Rettger and his associates (E. S. R., 71, p. 252), in which the mortality was as high as 65 percent, did not produce a demonstrable specific toxin in vitro for the natural host. Filtrates of 12-day broth cultures of this organism were not toxic for chickens and turkeys but were highly toxic for mice and rabbits. "These substances are 'nonspecific' in nature, since similar results in mice and rabbits are produced by filtrates of *E[scherichia] coli*. The production of this so-called nonspecific toxin is apparently correlated with cell death. The substances extracted from young cells by alternate freezing, thawing, and subsequent grinding are highly toxic for young turkeys. Substances extracted from *S. pullorum* in a similar manner are highly toxic for chicks. These toxic substances are not specific, since extracts of *E. coli* prepared in the same manner gave similar results. These substances are not true toxins, since no specific neutralizing antibodies were produced against them. The substances isolated by chemical fractionation possess both toxic and immunizing properties for young chicks and must be regarded as true toxins."

Large-scale testing of fowl's blood for the presence of S. pullorum infection, H. P. Hamilton (*Vet. Jour., 93 (1937), No. 5, pp. 175–178*).—An account is given of the methods employed in the large-scale testing of blood samples for *Salmonella pullorum* infection, based upon material received from some 15,000 different farms during the past 7 yr.

Some notes on the efficiency of home-made sodium hypochlorite as a disinfectant, H. P. Hamilton (*Vet. Jour., 93 (1937), No. 4, pp. 153–157*).—Reporting upon the efficiency of home-made sodium hypochlorite as a disinfectant, it is pointed out that an available chlorine content of 0.6 percent will kill the highly resistant *Salmonella pullorum* after an exposure of 5 min. at a dilution of 1 part of disinfectant to 10 parts of water.

Tables are given which show the germicidal properties of dilutions of the disinfectant in broth cultures of *S. pullorum* of from 1:2 to 1:20, the concentration of disinfectant necessary to inhibit growth of this organism in optimum conditions of temperature and media, the concentration necessary to inhibit *S. pullorum* and other bacterial growth in drinking water, and a comparison of nonstabilized and stabilized fluid.

Pullorum disease in ducklings, W. R. Hinshaw and H. A. Hoffman (*Poultry Sci., 16* (*1937*), *No. 3, pp. 189–193*).—An outbreak of pullorum disease in 4-week-old chicks and 1-week-old mallard ducklings in a flock in California is reported upon, circumstantial evidence being presented that the disease was transmitted to the ducklings from the chicks. "Complete studies of the strains of *S*[*almonella*] *pullorum* isolated from the ducklings and chicks are included in the report. These strains differed from the laboratory strains with which they were compared in the production of a wrinkled growth on agar, the formation of a slight pellicle on meat extract broth, and in their failure, when first isolated, to produce acid and gas in arabinose medium. After 1 yr. the duckling strain began producing acid and gas in arabinose broth. Reciprocal agglutinin-absorption tests made with two tested laboratory strains as controls showed the strains to be antigenically identical to *S. pullorum*. Both the duckling and chick strains produced typical pullorum disease in chicks but failed to infect one lot of 2-day-old Muscovy and one lot of 11-day-old mallard-Peking crossbred ducklings."

Relative abundance of crop worms in turkeys: Macroscopic differentiation of species, E. E. Wehr (*Vet. Med., 32* (*1937*), *No. 5, pp. 230–233, figs. 3*).—In an examination made of a large number of turkey esophagi collected at one of the poultry markets in Washington, D. C., *Capillaria contorta*, *C. annulata*, and *Gongylonema* sp. (probably *G. ingluvicola*), named in the order of their relative abundance, were found to be the parasites of the esophageal mucosa of turkeys in that vicinity.

An outbreak of parasitic necrosis in turkeys caused by Plagiorchis laricola (Skrjabin), A. Foggie (*Jour. Helminthol., 15* (*1937*), *No. 1, pp. 35, 36, fig. 1*).—A brief account is given, together with a description, of a small fluke (*P. laricola*) which was found to have caused the death of 11 in a flock of 23 turkey poults at the time of visitation of a farm in Northern Ireland.

Parasitic tumors in wild birds, L. C. Morley and J. E. Shillinger (*Jour. Amer. Vet. Med. Assoc., 91* (*1937*), *No. 1, pp. 94–97, figs. 2*).—An account is given of an extensive tumorous growth covering the breast of a red-winged blackbird, collected in New York State which appears to have been due to the mite *Harpyrynchus brevis* (Ewing).

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Nebraska Station] (*Nebraska Sta. Rpt.* [*1936*], *pp. 6, 7*).—The progress results are briefly presented of investigations of heating water for livestock, insulated electric brooders in uninsulated poultry houses, performance of rubber tires on tractors, and bindweed eradication machinery.

[Agricultural engineering investigations by the Ohio Station], G. W. McCuen, C. O. Reed, R. C. Miller, V. L. Overholt, I. P. Blauser, G. H. Stringfield, E. A. Silver, and C. W. Ellenwood (*Ohio Sta. Bul. 579* (*1937*), *pp. 108–112, 115–117, figs. 4*).—The progress results are briefly presented of investigations on farm operating efficiency, the use of electricity for soil sterilization and heating for tomato improvement, mechanical equipment for the planting

of irregularly shaped kernels of hybrid corn, pressure and load exerted by ear corn in cribs, apple washers to remove spray residue, and the combine harvester-thresher.

Headwaters control and use (*U. S. Dept. Agr., Soil Conserv. Serv. and Forest Serv., 1937, pp. IX+[1]+261, pls. 2, figs. 71*).—This publication contains the papers presented at the Upstream Engineering Conference held in Washington, D. C., September 22 and 23, 1936 (E. S. R., 75, p. 577). It has been published in cooperation with the U. S. Rural Electrification Administration. It contains papers (and discussions) on Basic Principles of Water Behavior, by T. Saville (pp. 1–15); Surface Run-Off Control, by R. E. Horton (pp. 16–49); Giving Areal Significance to Hydrologic Research on Small Areas, by M. Bernard (pp. 50–75); Influence of Vegetation on Land-Water Relationships, by I. Bowman (pp. 76–105); Management and Use of Forest and Range Lands, by E. H. Clapp (pp. 109–119); Management and Use of Agricultural Lands, Including Farm Woods and Pastures, by H. H. Bennett (pp. 120–157); Control and Use of Small Streams, by G. D. Clyde (pp. 158–178); A Survey of Effectiveness of Dams of the Soil Conservation Service (pp. 179–181); Farm Ponds for Water Supply and Flood Control, by W. H. McPheters (p. 181); Highway Construction and Water Conservation, by R. D. Brown (pp. 181, 182); Malaria Control, by L. L. Williams, Jr. (pp. 183, 184); Spreading Water Over Absorptive Areas for Storage Underground, by A. T. Mitchelson (pp. 184–187); Artificial Methods of Ground-Water Recharge, by R. Nebolsine (pp. 187, 188); Ground Water for Drought Relief, by J. Jacobs (p. 188); Zoning as a Technique for Water Conservation, by G. H. Gray (p. 188); Upstream Engineering and the Conservation of Wildlife Resources (p. 189–192); Relationships of Animal Life to Land and Water Resources, by C. L. Forsling (pp. 193–195); Wildlife—A Land Crop Favorable to Conservation of Water and Soil (pp. 195–197); Influence of Animal Life on Soil and Water Conservation, by E. G. Holt (pp. 197, 198); Physical and Functional Relationships, by M. L. Cooke (pp. 201–209); The Comprehensive Engineering Point of View, by S. M. Woodward (pp. 210–222); Big Waters and Little Waters, by E. M. Markham (pp. 223–226); Control and Use of Little Waters in France, by M. A. Maguein (pp. 227–232); Building Toward a Permanent Agriculture, by J. G. Lipman (pp. 233–236); On Behalf of a Continent, by M. Maverick (pp. 237–245); and The Human Value in Upstream Engineering, by C. H. Whitaker (pp. 246–249).

Soil and water conservation investigations, G. W. Musgrave and R. A. Norton (*U. S. Dept. Agr., Tech. Bul. 558 (1937), pp. 182, figs. 59*).—This is a progress report of investigations in the Missouri Valley loess region at Clarinda, Iowa, during 1931–35, conducted cooperatively by the Soil Conservation Service and the Iowa Experiment Station.

Preliminary data on canopy interception indicate the marked effects which various types of vegetation may have in the protection of the land surface, including a considerable portion of the control of erosion and run-off which is so commonly noted for alfalfa, clover, bluegrass, and even small grain and corn when the latter are fully developed.

Marshall silt loam was found to have an infiltration rate from 7 to 10 times that of Shelby silt loam. Soil porosity is indicated as perhaps the most important single factor, with the soil moisture content and the vegetative cover of less importance. Soil moisture apparently reduces infiltration on these two soils approximately in proportion to the space volume which it occupies. Vegetative cover may increase total infiltration through its effect in reducing the rate of run-off. It is doubtful whether any increase in rate of infiltration may be attributed to root effects of growing plants. Insofar as vegetative cover

prevents the application of turbid water to the soil profile, normal infiltration is maintained thereby as shown by other investigators.

The increase in soil porosity resulting from the application of organic matter to the surface of a normal profile has significantly (1) increased percolate through 3-ft. profiles of both permeable and relatively impermeable soils by large proportions, (2) decreased run-off, and (3) increased the store of potentially available water. The treatments have reduced erosion by large amounts, but have not exerted any marked effects upon evaporation. The potentially available water (rainfall less run-off) has been increased by about 2 surface inches a year in the Marshall and by about 1⅜ surface inches a year in the Shelby soil series by these treatments.

As the land slope is increased, impounding is decreased so rapidly that a treatment which will impound 2½ in. on level land will impound less than one-fourth as much on a 15-percent slope.

The control of run-off is the product of a large number of factors. The average run-off from manured corn has been reduced to 10 percent of the total effective precipitation, from bluegrass to 6 percent, alfalfa 6, clover 2, and from contour-listed corn to a mere trace. From manured land in corn, the maximum percentage of run-off from any rain has been 43 percent, from contoured listed corn 19, from bluegrass 14, from clover 6, and from alfalfa 5 percent.

The amount of soil carried by a cubic foot of run-off from bluegrass has averaged 0.19 lb., from continuous alfalfa 0.19, and from rotation clover 0.10 lb. of soil per cubic foot. These figures may be contrasted with a density of more than 5 lb. per cubic foot from continuous corn on eroded soil, continuous corn with rows in the direction of slope, and from fallow land, whether treated or untreated.

The effect of adding organic matter to Marshall silt loam which was excessively eroded was to reduce greatly run-off and erosion and to increase markedly soil moisture, rate of growth, and yield of corn. Green manure in the form of sweetclover produced yields above 50 bu. of corn per acre 2 yr. after artificially eroding the profile to a depth of 12 in.

Strip cropping is shown to be a somewhat different practice on the permeable Marshall silt loam than on less permeable soils. Combining primarily the effects of surface impounding and infiltration, theoretical protection equivalent to the maximum rain of a 15- to 20-yr. frequency may be secured through minor modifications of present farm practices. Additional protection may be provided by winter cover crops and the incorporation of organic matter in the soil in economical and practical ways. The study of slope lengths has revealed the uncertainty lying in an attempted estimate of the optimum width of crop strip.

Detailed studies of the costs of construction of about 10 miles of terraces revealed that on three sizes of terracing outfits, covering the range of tractor power which might be available, respectively, to the operator of an ordinary-sized Corn Belt farm, an extra large farm, and a group of farms or a small contractor engaged in earth-moving operations, there was very little difference in cost per unit length of terrace constructed between a 10- and a 15-hp. wheel-type tractor. A 15-hp. track-laying-type tractor built terraces for less than 60 percent as much per unit of length as either of the wheel-type tractors. The depreciation and interest on the investments were not considered in any of these computations.

Experienced grader and tractor operators may be able to reduce the cost of terrace construction to approximately 70 percent of that entailed by inexperienced operators. With soil in good condition for handling by the grader

it may be possible to build terraces with only 65 percent as much cost as will be required when the soil is hard and dry. Occurrence of gullies may increase the cost of terracing by as much as 20 to 25 percent in the Marshall silt loam area. The cost of building a terrace from 100 to 150 ft. long is nearly twice as great per unit of length as for a terrace 1,600 ft. long. This is due to the great amount of lost time in turning at the ends of the terrace.

Suspended-net woven-wire dams have not proved very satisfactory in gullies in which small amounts of water flow continuously. The Nebraska-type brush dam with suitable backing of woven wire on the upstream side seems quite satisfactory for ordinary types of gully control. For sidehill gullies, probably the most satisfactory control is terracing near the tops of the hills in order to prevent cutting at the head of the gully, then diverting water out of gullies which have already started and fencing them to keep out livestock.

Terrace-outlet ditches have been controlled quite satisfactorily by stake and rock checks reinforced by sod strips both above and below each check. Plank checks with sod strips above and below have thus far shown fair success.

In studies of the operation of farm machinery over terraced areas, a 10-ft. corrugated roller was found to operate quite satisfactorily parallel to the terraces. A 14-ft. disk harrow of standard construction seemed to lack somewhat in flexibility and clearance. A 16–7 fertilizer grain drill was found to be too lightly constructed to stand the strain due to operation on uneven ground either parallel to or across terraces. A 20-ft. flexible spike-tooth harrow of the pipe-bar type with a specially designed harrow cart has been found to operate very satisfactorily either parallel to or across terraces, but more especially when used up and down the hills at nearly right angles to the terraces. An 8-ft. power-driven grain binder was operated on terraced land with only partial success, mostly because of lack of clearance and flexibility for operation over uneven ground. Three-row corn-planting equipment functioned fairly well, but difficulty was encountered with the three-row cultivating equipment mounted on the same tractor. On terraces with vertical spacings of 4, 5, and 6 ft., a long variable graded terrace with intermediate spacing lost the greatest amounts of soil and water per unit of area and the one with the narrowest spacing lost more than the one with the widest spacing. When the terraces were uniformly graded the terrace with the widest vertical spacing lost more soil and water per unit of area than either of two others. In general, the flatter the grade of long variable graded terraces or long uniform graded terraces with the same vertical spacings the smaller the losses in soil and water.

There is a slight tendency for short terraces to lose more soil and water per unit of area than is the case with long terraces. Level terraces with open ends have operated very satisfactorily so long as they were kept on a good quality of Marshall soil. Level terraces with closed ends have so far not proved satisfactory.

A terrace planted to continuous corn shows greater losses of soil and water than those planted to either first- or second-year corn, oats, or clover. No very significant differences have been noted between any of the other four crops when compared among themselves.

An appendix includes additional tabular data on precipitation and run-off as related to erosion.

The homemade centrifugal pump, O. W. Monson and H. E. Murdock (*Montana Sta. Circ. 150 (1937), pp. 20, figs. 8*).—This circular replaces Bulletin 324 (E. S. R., 76, p. 400), which describes the home-made centrifugal or box pump which has been developed by the station. This pump is capable of delivering a volume of water sufficient for irrigation when operated under a low lift. Tests

showed that it will be practical as an irrigation pump for lifts of less than 12 ft., particularly if the pumping season is short and investment in high-priced commercial equipment is not justified.

The pump consists of a well or discharge box built from matched lumber, the height of which is equal to the operating lift plus about 3 ft. for submergence. At one side of the discharge box is an impeller chamber housing a double impeller mounted on a shaft supported on a thrust bearing. The impeller is driven by means of the pulley at the upper end of the shaft.

The water enters the impeller chamber through two intake holes around the impeller shaft, one at the top and the other at the bottom. As the water enters the impeller it is thrown outward by the centrifugal force of the rotating impeller and collects in a spiral around the outside of the impeller and is guided or conveyed into the discharge box.

Tests on use of rubber tires and steel wheels on a farm tractor, H. E. Murdock (*Montana Sta. Bul. 339 (1937), pp. 35, figs. 32*).—A large number of tests on a standard tractor are reported. All tests were run on summer-fallowed ground, part of which had been plowed and the remainder fallowed with a one-way disk, but all in approximately the same condition. The season was unusually dry, so the soil was very loose and dusty for most of the test period.

In fuel consumption the differences were small for the various series of tests with rubber tires but decreased slightly with an increase of wheel weights. The fuel consumption with heavy loads decreased slightly when inflation pressure was decreased. The fuel consumption was less with rubber tires than with steel wheels by from one-sixth to two-fifths of a gallon per hour, or about 5 to 8 percent less for the rubber tires. There was some variation with the load.

An increase in the drawbar pull decreased the speed, this decrease being more rapid with the lower wheel weights. The maximum drawbar pull and horsepower were higher with the large rubber tires. The maximum drawbar pull varied slightly with the inflation pressure, being lower for the high inflation pressures, but the maximum practicable drawbar pull was about the same in all gears with rubber tires. The maximum horsepower with rubber tires was greater in the higher gears. The addition of wheel weights with the rubber tires increased both the maximum drawbar pull and the horsepower. The pull was increased an amount varying from one-third to two-thirds the value of the added weight and averaged nearly one-half the added weight. The increase in the maximum horsepower caused by adding 870 lb. amounted to from 25 to 65 percent.

With steel wheels the maximum drawbar pull was greater for the lower gears, but the maximum horsepower was about the same for all gears. The maximum drawbar pull and horsepower with the large rubber tires were higher than for the steel wheels, while for the small tires they were less, but the differences were not great.

The slip with rubber tires was generally higher than that with the steel wheels and lugs, except at the lower inflation pressures and with the higher amount of wheel weights. The slip with the rubber tires was greater with the higher inflation pressures and less with a larger wheel weight. The rate at which the slip increased with an increase in the drawbar pull was less with the large rubber tires than with the small tires.

In high gear the tractor pulled larger loads when equipped with rubber tires than with steel wheels. Acre costs of operations with rubber tires were less in the high gears, while with steel wheels they were more uniform in the three gears.

Rotary spray irrigation, O. E. Robey (*Michigan Sta. Quart. Bul., 19 (1937), No. 4, pp. 212–217, figs. 5*).—Information is given on the mechanical details of equipment used for rotary spray irrigation.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Ohio Station, 1935–36] (*Ohio Sta. Bul. 579 (1937), pp. 100–106*).—Results of studies not previously noted are reported as follows: (1) Table, by F. L. Morison, showing the productivity balance, manure equivalent, percentages of rotated areas in row crops, small grains, and hay and rotation pasture, the productivity factor for hay, and yields per acre of corn and wheat on 422 farms in 6 counties in 1936, grouped into 4 groups on the basis of soil depletion; (2) table, by C. W. Hauck, showing customers' methods of selecting canned foods in a Columbus retail grocery store before and after 3 months' advertising, featuring grade labeling; (3) table, by G. F. Henning, showing the factors influencing farmers in 5 areas of the State to market livestock through cooperative or noncooperative agencies; and (4) table, by R. W. Sherman, showing the average amounts charged by distributors and received by producers per 100 lb. of milk sold as fluid milk and cream during the first 3 mo. of 1933 and 1934, September 1934, February 1935, and August 1936 in 10 markets of the State, representing approximately 55 percent of the milk-consuming population of the State.

[Papers on agricultural economics] (*Pacific Coast Econ. Assoc., Ann. Conf., Papers and Proc., 14 (1935), pp. 1–7, 55–74*).—Included are the following papers on farm economics presented at the fourteenth annual conference of the Pacific Coast Economic Association, December 1935: The New Relation of Government to Agriculture in the United States, by W. L. Wanlass (pp. 1–7); Changes of Emphasis in Government Efforts to Aid Agriculture, by E. F. Dummeier (pp. 55–61), with discussion by H. C. Farnsworth (pp. 62, 63); Economics of Production Control, by E. L. Potter (pp. 64–67), with discussion by C. Akerman (p. 68); and Governmental Control of Agricultural Prices, by G. E. Hoover (pp. 69–72), with discussion by N. J. Silberling (pp. 73, 74).

[Papers presented before the British Agricultural Economics Society] (*Jour. Proc. Agr. Econ. Soc., 4 (1935), No. 1, pp. 14–83, figs. 2; 4 (1936), Nos. 2, pp. 89–149, figs. 2; 3, pp. 167–258, figs. 5*).—These reports continue the series previously noted (E. S. R., 72, p. 266). The following papers, with discussions, presented at the conferences in 1935 and 1936 are included: No. 1, Conference at Cambridge, June 28–July 1, 1935—Presidential Address—The Expectation of Agricultural Recovery, by R. R. Enfield (pp. 14–43); Agriculture in France, by M. Augé-Laribé (pp. 44–54); Scientific Progress and Agricultural Employment, by A. Bridges (pp. 55–76); and The Scottish Crofter, by J. M. Ramsay (pp. 77–83); No. 2, Conference at London, December 10–11, 1935—Food Supplies and Consumption at Different Income Levels, by E. M. H. Lloyd (pp. 89–120); Statistical Investigations Into Organised Marketing of Milk, by J. L. Davies (pp. 121–134); and Land Settlement and Unemployment, by A. W. Menzies-Kitchin (pp. 135–149); and No. 3, Conference at Oxford, July 3–6, 1936—Presidential Address—The Relations of Land Tenure and Agriculture, by H. M. Conacher (pp. 167–202); World Agriculture and the Problems of Nutrition, by F. L. McDougall (pp. 203–222); Research and Price Control, by R. L. Cohen (pp. 223–249); and Organising Farm Workers, by J. F. Duncan (pp. 250–258).

[Farm economics in Great Britain] (*Farm Econ. [Oxford Univ.], 2 (1936), Nos. 1, pp. 20, figs. 2; 2, pp. 21–36, figs. 5; 3, pp. 37–52, figs. 2; 4, pp. 53–72, figs. 3*).—These publications continue the series previously noted (E. S. R., 71, p. 264) and include in addition to lists of publications and charts showing prices of agricultural commodities in England and Wales the following articles: The Outlook for Milk, by C. S. Orwin (pp. 1, 2); The Condition of Cowsheds, by R. N. Dixey (pp. 3, 4); Some Trends in Dairy Farming in South Devon, by W. H. Long (pp. 5–8); Changes in Milk Output on Ten West Country Grassland Dairy Farms, by F. H. Villiers (pp. 9, 10); Observations on the Depreciation of Cows and

Calving Records of a Commercial Farm, by F. R. G. N. Sherrard (pp. 11–13); Why Not Separated Milk? by S. M. Makings (pp. 14, 15); Fruit Consumption—The Importance of Imports, by J. F. Cahan (pp. 15–17); Food Imports and the Italian Sanctions, by C. S. Orwin (pp. 21, 22); Sugar Beet Costs and Returns, 1932–35, by A. Bridges (pp. 22–24); Pig Production Costs in Denmark, by A. W. Menzies-Kitchin (pp. 25–27); Milk: Delivery to the Station, by R. N. Dixey (pp. 27, 28); Seasonal Variation in the Output and Prices of Eggs, by O. J. Beilby (pp. 29–32); Tenancy Changes on Small Holdings, by W. F. Darke (p. 37); Winter Food Requirements for Milk Production, by C. V. Dawe and J. E. Blundell (pp. 38, 39); Monthly Cash Receipts and Expenses on 18 Yorkshire Poultry Farms, by J. D. Nutt (pp. 40, 41); Giving the Consumer the Manufacturing Milk, by S. M. Makings (pp. 41–44); The Trend of Milk Prices in the Eastern Counties, by P. E. Graves (pp. 44–46); Change in Market Receipts of Fat Cattle Since the Introduction of the Subsidy, by R. P. Askew (pp. 46–48); Combine-Harvesting Costs in 1935, by R. P. Askew (pp. 53–57); Machine Versus Hand-Milking, by A. L. Jolly (pp. 57–59); The Relationship Between the Prices and Costs of Pork and Bacon Pigs, by J. R. Lee (pp. 59, 60); Causes of the Recent Rise in Egg Prices, by O. J. Beilby (pp. 61–63); The Effect of Recent Currency Depreciation on British Agriculture, by R. Cohen (pp. 63–67); and Milk in Schools, by K. A. H. Murray (pp. 67, 68).

Foreign Agriculture, [June 1937] (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr., 1 (1937), No. 6, pp. 261–314, figs. 3*).—Included are articles, An Appraisal of Recent French Wheat Policy, by L. D. Mallory (pp. 263–298), and The London Sugar Agreement, by E. P. Keeler (pp. 299–310), and notes on the promotion of cotton production in southeastern Europe (pp. 311, 312), British government plans additional aids to farmers (pp. 312, 313), and Japan-India cotton agreement extended (pp. 313, 314).

Hogs in Belgian agriculture, H. E. Reed (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Agr. Serv., F. S. 68 (1937), pp. [2]+12*).—The number of hogs, types, breeds, management and feeding practices, marketing, slaughter, and processing in Belgium are briefly described. Consumption of pork, imports into, fat deficiency in, and trade relations with other countries are discussed. The conclusion is reached that conditions do not appear favorable for future outlets for American pork products in Belgium.

International yearbook of agricultural legislation, 1933 [trans. title] (*Inst. Internatl. Agr. [Roma], Ann. Internatl. Lég. Agr., 23 (1933), pp. LXX+1259*).—This volume continues the series previously noted (E. S. R., 72, p. 270). The legislation regarding agricultural and commercial statistics, trade in agricultural products, prices, tariffs and taxes, diseases of and regulations pertaining to plants and animals, agricultural education, cooperation, insurance, credit, rural property, emigration and migration, rural hygiene, etc., is included. The introduction summarizes and discusses the legislation.

Possible savings through changes in local government, H. C. Bradshaw and L. P. Gabbard (*Texas Sta. Bul. 540 (1937), pp. 92, figs. 4*).—This study is based upon data regarding receipts and expenditures in 1933 for 38 counties and the 1,130 school districts therein. In selecting the counties the State was divided into 8 areas based principally on the type of farming. In each area counties were selected representing low, average, and high land areas, populations, and assessed valuations. Information was also obtained as to number and qualifications of employees, budgeting, purchasing, custody of funds, maintenance of roads, protection to person and property, and other governmental activities.

The duties, qualifications, and compensation of county officers in Texas are described. Tables are included and discussed showing the receipts in 1933 o

the counties and school districts by sources and the expenditures classified according to character and functions. County expenditures are also classified according to object. The possibilities of savings in expenditures of the counties and school districts are discussed and recommendations made as to methods by which such savings may be effected.

The average total per capita costs in the 38 counties was $18.88, of which $8.16 was for education. The trend was for costs to decrease with population, the average for the 4 counties with from 2,197 to 5,000 population being $28.18 and $12.36, respectively, as compared with $15.99 and $7.58, respectively, for the 6 counties with over 35,001 population.

The recommendations for the school districts include (1) the putting into effect of the reorganization plan of the State Board of Education, (2) the apportionment of State funds to equalize and improve educational advantages, and (3) appointment of the State and county superintendent of schools on the basis of merit and to hold as long as services are satisfactory.

The recommendations as to counties include (1) consolidation of counties, (2) the adoption of either a county manager or county executive plan of organization, (3) development of cooperation among counties in handling certain functions, and (4) additional State interest in and responsibility for the work performed by the counties. In county consolidation it is recommended that a county should have a minimum population of 20,000 and a minimum assessed valuation of from $10,000,000 to $12,000,000. Consolidation of counties of less than 5,000 population, it is estimated, would save $2.91 per capita, being 21 percent of the total cost of county government, 25 percent of the current or operating costs, and 63 percent of the costs affected by consolidation.

Farm tenancy in the United States, 1918–1936—A selected list of references, compiled by L. O. Bercaw (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 70 (1937), pp. VIII+302*).—This bibliography is a revision of that previously noted (E. S. R., 74, p. 557). It includes 1,070 selected references to books, pamphlets, and periodical articles on farm tenancy and farm leases in the United States. There are a few references to publications issued prior to 1918 and in 1937, and a few on corporation farming and group management of farms. The bibliography is divided into three main sections—general references, references by geographical divisions, and references by States. Author and subject indexes are appended.

Recent agricultural credit developments relating to commercial banks, N. J. Wall (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. [2]+16, figs. 2*).—This report is based on data for the year ended June 30, 1936, secured in cooperation with the Federal Deposit Insurance Corporation, the Comptroller of the Currency, and the Board of Governors of the Federal Reserve System. It continues the study previously noted (E. S. R., 76, p. 121). A table is included showing the outstanding short-term credit of Federally sponsored agencies, December 31, 1929–35, and June 30, 1936.

Agricultural loans of commercial banks decreased approximately 12 percent from December 31, 1934, to June 30, 1936, there being a decrease of $146,007,000 in personal and collateral loans and a decrease of $9,525,000 in loans secured by real estate. The latter, however, increased slightly from December 31, 1935, to June 30, 1936. The decrease in personal and collateral loans was due largely to reductions of outstanding loans secured by warehouse receipts, bills of lading, etc. The States where such loans had been secured largely by livestock showed a slight increase. Short-term loans (*excluding emergency drought, rehabilitation, and seed loans*) of Federally sponsored institutions also showed a slight declining trend. Deposits in country banks showed a very marked rise since the spring of 1933, demand deposits in Federal Reserve member banks in places of less than

15,000 population in 20 leading agricultural States being 105.8 percent of the 1923–25 monthly average as compared with 48.2 percent in April 1933. The increase was due to increased farm prices and income and disbursements for work relief, drought expenditures, and other emergency programs.

Farm mortgage foreclosures in South Dakota, 1933–34–35–36, G. Lundy (*South Dakota Sta. Circ. 17, Sup.* [1937], *pp* [6] *figs. 3*).—This supplements the circular previously noted (E. S. R., 71, p. 867).

A graphic summary of physical features and land utilization in the United States, O. E. Baker (*U. S. Dept. Agr., Misc. Pub. 260* (1937), *pp. II+57, figs. 70*).—This is one of a projected series previously described (E. S. R., 77, p. 117), dealing with temperature and duration of the frost-free season, moisture, topography, and soils.

Land use and soil conservation practices in Mecosta County, E. B. Hill and H. B. Taylor (*Michigan Sta. Quart. Bul., 19* (1937), *No. 4, pp. 207–212*).—The data obtained in a farm management survey in 1936 of 78 farms in two townships are analyzed to show the land uses, crop yields, number of livestock, operator's age and experience, farm indebtedness and financial returns, and the butterfat production and returns per $1 worth of feed fed in the dairy enterprise. The soil conservation practices in use are briefly discussed.

On farms with less than 40 percent of the rotation land in hay and pasture, crop yields, particularly corn, wheat, oats, and potatoes, averaged about 10 percent lower than in the over 40 percent group. The amounts of livestock per farm, size of dairy herds, and pounds of butterfat sold per cow were about the same in both groups. The farmers in the over 40 percent group fed their cows 22 percent more hay, 12 percent more concentrates, and 18 percent less succulent roughages and dry roughages other than hay. The average amount left for operator's labor and management wage (net returns less allowance for unpaid family labor and interest on investment) on 77 of the 78 farms was $410. Chiefly because of lower cash expenses, it was $446 on the 36 farms in the less than 40 percent group and $378 on the 41 farms in the over 40 percent group.

Thirty-one of the farmers had changed their cropping system since 1930 by increasing the acreages in legume hay 19 percent and corn 1 percent and by decreasing those in nonlegume hay 42 percent, wheat 7 percent, and other small grains, potatoes, and rotation pasture each 4 percent. On the 78 farms there were increases from 1930 of 6 percent in cows and 57 percent in sheep and decreases of 4 percent in hens and 13 percent in hogs. About 15 percent of the farmers were considering increasing the size of their farms; 9 percent were considering decreasing.

A program for land use in northern Minnesota: A type study in land utilization, O. B. Jesness, R. I. Nowell, et al. ([*Minneapolis*]: *Univ. Minn. Press, 1935, pp. XVI+338,* [*pls. 4*], *figs.* [*40*]).—This type study in land utilization was made by the University of Minnesota and the U. S. D. A. Bureau of Agricultural Economics. The volume includes chapters by O. B. Jesness on the background of the study, present policies and programs of adjustment, and translating proposals into effective programs; by R. I. Nowell on the natural, social, economic, and governmental characteristics of the region, present uses of land, land classification and zoning, acquisition and utilization of land for public purposes, and problems involved in moving farm families; by H. F. Hollands on the economic and social consequences of planless land use; by J. H. Allison on improved utilization of private forest lands; by G. A. Pond and C. W. Crickman on improved use of agricultural land; and by M. Regan on adjustments in local government.

Factors affecting the economic self-sufficiency of the Middle Rio Grande Conservancy District, P. W. Cockerill (*New Mexico Sta. Bul. 247 (1937), pp. 20*).—"The purpose of this bulletin is to set forth suggestions for improvement in marketing food products produced for the home market, together with the consideration of some of the factors entering into the selection of enterprises for the purpose of production for both local and outside markets." The possibilities of producing products for which a national market exists are briefly discussed. The bulletin, however, is devoted chiefly to a discussion of the production of fruits, vegetables, eggs, dairy products, etc., for local consumption in competition with shipped-in products. This discussion is based on data obtained from 450 housewives and 50 leading grocers in Albuquerque, and 18 merchants in Gallup, Bernalillo, Santa Fe, and Las Vegas, N. Mex.

Recommendations for the improvement of agricultural conditions in Kansas (*Topeka: Kans. State Planning Bd., 1936, pp. [47], [fig. 1]*).—This report of the Kansas State Planning Board to the National Resources Committee includes its recommendations as to the coordination of land use and water problem studies, administrative policies, land use, taxation and credit policies, research, demonstration, surveys and investigations, and water use. Appendixes include memorandums on research, prepared by the Kansas Experiment Station and the division of extension of the Kansas State College, an article on Character and Composition of the Population of Kansas, by C. D. Clark, and a chart and table showing the extent of past Federal assistance to agriculture in the State.

Large scale and corporation farming: A selected list of references, compiled by E. M. Colvin (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 68 (1937), pp. VII+121*).—This selected list of 406 references covers the period December 1929–April 1937, with a few references to earlier material. It supplements a bibliography previously noted (E. S. R., 63, p. 84) and supersedes that on group and chain farming in the United States (E. S. R., 69, p. 603). The references are arranged by countries, those in the United States being subdivided into the following groups: General, group management, Great Plains and Middle Western States, Southern States, and individual States.

Economic analysis of potato production in northern Indiana, L. Robertson (*Indiana Sta. Bul. 412 (1936), pp. 28, figs. 17*).—The adaptability of the 22 northern counties of Indiana for potato production, the production and trends in production in these counties, and the market outlets for potatoes from the section are discussed. Data for 1934 as to costs of production and receipts from potatoes obtained from 56 farms with late muck potatoes, 18 with late upland potatoes, 15 with early muck potatoes, and 15 with early upland potatoes are analyzed. The factors affecting costs, the labor distribution on potatoes, and ways of improving the market for northern Indiana potatoes are discussed.

Sugar beet production and marketing costs, [1936], K. T. Wright (*Michigan Sta. Quart. Bul., 19 (1937), No. 4, pp. 217–222*).—Records from 87 farmers obtained in the fourth year of the study (E. S. R., 75, p. 866) are analyzed to show the yields; production, marketing, and labor costs; machine work done; and the effects of costs of labor, power, and machinery per acre on yields and total production costs, and of distance to sugar beet plant on production and marketing costs.

An economic study of livestock farms in Maryland, W. E. Bell, A. B. Hamilton, S. H. DeVault, and D. Meade (*Maryland Sta. Bul. 406 (1936), pp. 253–298, figs. 14*).—"The purpose of the study was (1) to determine whether commercial livestock farms in the State are being operated on a profitable

basis, (2) to determine the influence of various factors of production on profitableness, (3) to determine livestock management practices, and (4) to determine what combinations of enterprises, factors of production, and management practices give the largest net returns." Data were secured regarding 50 farms in 1934 and 57 farms in 1935 in 5 counties in central Maryland.

The labor incomes in 1924 ranged from $4,546 to —$3,617, averaging —$151, and in 1935 from $4,331 to —$2,373, averaging $94. For the 2 yr. 54 farms had plus labor incomes, averaging $978, and 53 minus labor incomes, averaging —$1,038. The profitable farms as compared with the unprofitable farms averaged 49 acres less, 10 acres less in crops, $10,477 smaller total investment, $10.405 less investment in land and buildings, 1.3 more animal units, $859 larger total receipts, $633 less total expenses, $478 greater receipts from livestock and $98 greater receipts from crops, and 9.1 mo. less of hired labor. Yields per acre of corn, silage, wheat, and barley were greater and those of rye, oats, alfalfa, and other hay less on the profitable farms.

The livestock organization management and marketing for the farms are described. Suggestions are made as to how practices may be improved with a view to increasing labor incomes.

Cattle ranching in Montana: An analysis of operating methods, costs, and returns in western, central, and eastern areas of the State, M. H. SAUNDERSON and D. W. CHITTENDEN (*Montana Sta. Bul. 341 (1937), pp. 32, figs. 2*).—"The purpose of this bulletin is (1) to describe the operation and management method of beef cattle ranches, and (2) to analyze operating costs and income as related to operating practices and ranch management from the standpoint of the ranch operator." It is based chiefly on detailed records covering the period 1929–34 on the resources and operations of about 100 ranches varying in size from 100 to 3,000 head of cattle, the most common number being about 400. The ranches included are fairly typical of the different regions of the State—western, central, and eastern or plains. The annual operating costs per head, production costs for different types of cattle, labor costs, land charges, and hay, feed, equipment depreciation, and bull service costs are discussed. The effects on income of percentage calf crop; weight, quality, and breed of animals; death losses; classes of animals marketed and their prices in relation to production costs; size of ranch in relation to efficient management; and family income needs and supplemental enterprises are also discussed. Operating data for three individual ranches are included in an appendix.

Western cattle and sheep areas, described for the use of cooperative marketing and credit associations, L. B. MANN (*Farm Credit Admin. [U. S.], Coop. Div., Circ. C-103 (1936), pp. I+101, figs. 28*).—The production and marketings are described for each of 71 cattle- and 70 sheep-production, grazing, and feeding areas into which the 17 Western States have been divided, with a view to assisting cooperative marketing and credit associations.

Purchases of feeds and grains in Alabama, 1935: A progress report, B. T. INMAN (*Alabama Sta. Circ. 77 (1937), pp 11, fig. 1*).—This is a progress report in a study of the balance of production and consumption of farm products in Alabama. Tables are included showing for 1935 the quantities and retail values of State-grown and out-of-State-grown commercial feeds and oats, corn, cottonseed hulls, and different kinds of hay. A map shows by counties the percentages of State feed expenditures in 1929. A table shows the number of farms by type of farm reporting expenditures for feed per farm and the total and average expenditures for the different types of farms.

"Feed dealers sold $10,295,827 worth of feeds in Alabama in 1935, $6,409,363 of which were for feeds not grown in the State. The chief shortage of feed

materials in Alabama is in those materials with medium and low protein content, particularly grains. The present production of such high protein feeds as cottonseed meal and peanut meal are in excess of needs with present feeding standards. The shortage of grains for food and feed materials could be modified very much by the increased production of corn and oats. Corn and oats for both the food and feed markets can be supplied in the State if certain improvements are brought about such as: (a) Adequate storage space, (b) weevil control, (c) better standardization of corn varieties, (d) improved quality of corn, and (e) lower production costs."

Cooperative marketing of agricultural products, W. W. Fetrow (*Farm Credit Admin.* [*U. S.*], *Coop. Div., Bul. 3 (1936), pp. IV+106, figs. 20*).—The development and present status in the United States of cooperative associations for marketing cotton, fruits, vegetables, nuts, grains, livestock, dairy products, poultry products, tobacco, wool and mohair, rice, dry beans, forage crops, seeds, honey, maple sirup, cane sugar and sirup, and sugar beets are described.

A study of grades, price trends, and sales on the Indianapolis Producers' Market, K. I. Fawcett and F. C. Gaylord (*Indiana Sta. Bul. 411 (1936), pp. 44, figs. 32*).—Data were obtained by a man experienced in the grades and quality of fruits and vegetables as to the volumes, grades, sources of supplies, prices received, etc., on the Indianapolis Producers' Market during a 22-week period, from April to September 1933. Tables show the values of dealers' and producers' sales, monthly receipts and value of sales for different products, value of weekly sales, sales from the more important Indiana counties and dealer sales by State of origin, weekly receipts, and average weekly prices of different fruits and vegetables.

The marketing of different products is described with graphs for the more important, showing the weekly variations, receipts, and prices.

Fifty different fruits and vegetables were sold during the period, the total sales being approximately $553,000. Producers received 62 percent and dealers 38 percent of the total value. Of the total sales, 84 percent were of tomatoes, cantaloups, apples, peaches, potatoes, corn, strawberries, cabbage, green beans, pickles, watermelons, onions (dry), greens, and raspberries. Sales included products from 23 States and 41 Indiana counties, 73 percent of the latter being from 19 counties.

A survey of organization and methods of operation of twenty Indiana city markets, F. C. Gaylord and K. I. Fawcett (*Indiana Sta. Bul. 417 (1936), pp. 28, figs. 9*).—This study of 20 representative markets was made to obtain information for improving existing markets and offering suggestions in regard to organizing, maintaining, and operating growers' markets. Five municipal, 4 private, and 11 cooperative markets were studied, the markets ranging in size from a small cooperative to the large privately owned Indianapolis market. Three of the markets were primarily wholesale markets. The business of the other markets ranged from 65 to 100 percent retail. The buildings, facilities, plan of operation, etc., of each market are briefly described and suggestions made as to location, type of building, displaying and grading products, etc.

Organization of the Louisville wholesale fruit and vegetable market, H. B. Price, C. D. Phillips, and S. E. Weather (*Kentucky Sta. Bul. 368 (1937), pp. 27, figs. 4*).—This is a preliminary report on the study made in 1935 and 1936. The importance of the Louisville market, its organization, the city as a market for locally grown fruits and vegetables, the gardeners' and farmers' market, the number and activity of wholesale dealers, and the extent of intercity trucking are discussed.

Marketing fruits and vegetables by motor truck in western Maryland, R. Russell and R. W. Lennartson (*Maryland Sta. Bul. 407 (1936), pp. 299–375,*

figs. 6).—This study was made to ascertain the extent to which trucks are used in the marketing of fruits and vegetables in the areas studied, the costs involved in the use of trucks, the effects of the use of trucks on marketing facilities and practices, and the cost of all services in marketing fruits and vegetables. Data for the year ended June 30, 1934, were obtained from 90 growers selling in the Baltimore, Md., markets, 60 in the Washington, D. C., markets, and 39 growers in Washington County, Md.

The markets serving each area are described, and growers' opinions and suggestions regarding the Baltimore and Washington, D. C., markets are discussed. An analysis is made of the number of trips made by growers to each market, the tonnage and value of products marketed, the time consumed in different phases of the marketing at each market, and the various marketing costs for all commodities, for individual commodities, and through different marketing channels.

For the 189 growers, marketing costs average $7.69 per ton, being 27.8 percent of the gross value of the products. Commission fees were 16.1 of the total marketing costs, transportation costs 27.2, container costs 38.1, other selling costs 15.4, and storage 3.2 percent. Total marketing costs for individual commodities varied from 20 to 37.4 percent of the gross value. The costs for the different areas varied from 8.8 percent for asparagus in the Baltimore area to 46.7 percent for apples in the Washington, D. C., area.

The Twin City milk market, O. B. Jesness, W. C. Waite, and P. E. Quintus (*Minnesota Sta. Bul. 331 (1936), pp. 24, figs. 5*).—The milk market of Minneapolis and St. Paul is described, with tables and charts showing, by years, the fluid sales of pasteurized, raw, and certified milk, 1921–35, and pasteurized and raw cream, 1924–35, in Minneapolis; the seasonal variations in sales, 1923–31; the percentages of sales in different size units; monthly retail prices of milk, 1919–35; range of and average prices paid by distributors per 100 lb. of milk; average annual distributors' margin per quart, 1919–35; etc. Marketing agreements and licenses, public regulation, and producer-distributors are briefly discussed. The membership and organization of the Twin City Milk Producers' Association, its finances, and volume of milk produced; disposition of milk to distributors and surplus milk manufactured, by years 1920–35; the percentages of whole milk used, sold as fluid milk, separated, used in cheese, condensed, and used in ice cream, by years 1926–35; the expenses of operation, seasonal variations in production, monthly prices paid members for 3.5 percent milk, 1919–35, etc., are described. The question as to whether the association should engage in retailing is briefly discussed.

Marketing onions, J. W. Park (*U. S. Dept. Agr., Tech. Bul. 555 (1937), pp. 88, figs. 22*).—Tables are included showing the acreages and production, 1926–35, by State groups; shipments by States, 1926–35; imports by months, 1930–34, by countries of origin; exports by months, 1930–34; average seasonal farm prices and farm values of onions by States, 1926–35; and average monthly wholesale prices in less than carlots by types or varieties and States of origin in Boston, New York, Philadelphia, and Chicago from 1930–31 to 1935–36. The important onion areas and districts of the United States, varieties and types of onions grown, foreign trade, and the number of the large onion markets of the United States are described. Harvesting, grading, sizing, packing, Federal and State inspection, loading cars, transportation, storage, shrinkage, financing, methods of shipment, movement by months, distribution of shipments, and methods and channels of city distribution are discussed.

Corn futures (*U. S. Dept. Agr., Statis. Bul. 55 (1937), pp. 101, figs. 4*).—This bulletin supplements that previously noted (E. S. R., 70, p. 855) by the addition

of data as to volume of trading, open commitments, and prices from January 3, 1933, to December 31, 1935.

Grade, staple length, and tenderability of cotton in the United States, 1928–29 to 1934–35 (*U. S. Dept. Agr., Statis. Bul. 56 (1937), pp. 63, figs. 11*).—This bulletin continues the series previously noted (E. S. R., 75, p. 273). Detailed tables by States, districts of States, and specified periods of the ginning season are included for the 1934 crop and more general tables for the preceding years.

Quality of cotton ginned in Mississippi, crops of 1928–34, W. B. LANHAM, F. H. HARPER, and M. DODSON (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. [2]+38, figs. 11*).—This study was made in cooperation with the Mississippi Experiment Station. In analyzing the data the State was divided into 4 areas with 18 districts on the basis of similarity of conditions affecting quality of cotton. Tables, charts, and maps are included showing for the United States, Mississippi, and each district by years the amounts—bales and percentages—of cotton of different grades and staple lengths.

For the 6-yr. period an average of nearly 79 percent of the Mississippi cotton crop was extra white, white middling, or above in grade as compared with 68 percent of the upland cotton crops of the United States. The average staple length was 16.7 sixteenths inch for Mississippi and 15.32 sixteenths inch for the United States. The proportion of ginnings in Mississippi grading extra white and white middling and above decreased and the proportion of 15/16 in. and shorter staple also decreased as the season advanced.

Quality of Texas cotton, crops of 1928–35, W. B. LANHAM, G. E. MILLER, and N. L. GOUDY (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. [2]+61, figs. 11*).—This study was made in cooperation with the Texas Experiment Station. In tabulating and analyzing the data the State was divided into 11 general soil areas with further division into subareas. The soil types and climatic conditions of the soil areas are described. Tables and charts are included and discussed showing the staple lengths and grades of cotton in the United States, Texas, and the different areas and subareas, 1928–35. An analysis is also made of the staple length and grade of Texas cotton by ginning periods.

The average staple length for the 6-yr. period was 15.32 sixteenths inch for the entire United States crop and 15.04 sixteenths inch for the Texas crop. The grade was approximately the same for the United States and Texas. The average staple length in Texas varied in soil areas but the grade in general was fairly uniform. Staple length became less and grade decreased as the ginning season progressed.

Crops and Markets, [June 1937] (*U. S. Dept. Agr., Crops and Markets, 14 (1937), No. 6, pp. 109–128, figs. 2*).—In addition to the usual crop and livestock production and market reports, seasonal reports are included on the condition of important crops, the reduction in cotton yields from stated causes, and the stocks of barley and rye on farms, June 1. Revised estimates for cotton, 1935–36, and cottonseed, 1936, are also included.

Revised estimates of sweet potato acreage, yield per acre, and production, 1868–1928, C. M. PURVES, D. F. CHRISTY, G. BURMEISTER, ET AL. (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. 30*).—Tables for the United States and for geographic divisions and States are included. The United States estimates of production included 19 States in 1868 and 22 in 1918–23.

First annual report on tobacco statistics (with basic data) (*U. S. Dept. Agr., Statis. Bul. 58 (1937), pp. 148, fig. 1*).—This is the first of a series of annual reports required by the amendment to the Stocks and Standards Act approved August 27, 1935. "In this report effort has been made to have the statistics as complete as possible so far as recent history is concerned, and fairly

comprehensive as to the range of subjects covered, with the expectation that future issues will be restricted to current and relatively recent years. Under this plan this report may be regarded as of permanent value for reference purposes, future issues to be in the nature of supplements." A brief classification of leaf tobacco covering classes and types and a map showing the tobacco-growing districts of the United States are included. Tables cover the acreage, production, and farm value of tobacco in the United States by classes, types, and States, foreign production by countries and classes, prices by weeks and seasons for different types and grades, stocks by types and grades by quarter years, leaf tobacco used in manufacture, tax-paid withdrawals by products and months, per capita consumption in different forms in the United States and European countries, exports for the United States of leaf tobacco by types and countries and of products, imports of leaf tobacco by classes and of products by countries, tariff rates on imports into the United States and into other countries from the United States, taxes and revenue in the United States, railroad and ocean transportation rates, and data as to the number of contracts, processing tax rates, tax collections, etc., under the AAA.

Statistical analysis of the annual average f. o. b. prices of California canned apricots, 1926–27 to 1936–37, H. R. Wellman (*California Sta. Mimeogr. Rpt. 60 (1937), pp. 8, fig. 1*).—An analysis is made of the average relationships between f. o. b. prices of canned apricots and total shipments of California canned apricots and index of prices of competing canned fruits. "An increase in total shipments of canned apricots from 2,500,000 cases to 3,000,000 cases has been accompanied by a decrease of 21 ct. a case in the average f. o. b. price, and vice versa, and an increase in the index of competing canned fruit prices from 70 to 80 has been accompanied by an increase of 59 ct. a case in the average f. o. b. price, and vice versa."

Wholesale prices received by farmers for whole milk, 1909–1936, R. E. Johnson (*U. S. Dept. Agr., Bur. Agr. Econ., 1937, pp. 60*).—Tables show for the United States and different geographic districts and States the average monthly prices, August 1909 to December 1936, inclusive, received by farmers for whole milk sold at wholesale.

Fats, oils, and oleaginous raw materials: Production, prices, trade, disappearance in the United States, 1912–35, and available data for earlier years, A. Dewees (*U. S. Dept. Agr., Statis. Bul. 59 (1937), pp. 123*).—The classification of fats and oils is described. Tables cover the production, imports, exports, prices, stock, and disappearance of the different vegetable oils, animal fats and oils, marine animal oils, and the raw materials for such fats and oils. Other tables show tariff rates and excise taxes on and weights and measures of different fats and oils; the saponification value, iodine number, melting point, and titer for leading fats and oils; and the percentages of the more important fatty acids in commonly used fats and oils.

RURAL SOCIOLOGY

Outlines of a rural research program for Utah, L. Nelson (*Utah Acad. Sci., Arts, and Letters, Proc., 13 (1935–36), pp. 27–30*).—The author presents as pressing problems the conservation of natural resources, land use, wildlife, and population relative to natural resources. Without neglecting the older research in the physical and biological fields, he would emphasize the human-economic and social problems of Utah. He points out the importance of teamwork and lists some of the institutions and agencies engaged in agricultural research in the State.

Movements of rural population, C. E. Lively (*Ohio Sta. Bul. 579 (1937), p. 106*).—An analysis of the vital statistics of the rural population of the State is

noted which shows that the number of rural births has been declining steadily since 1924 and that the natural increase of the rural population has declined correspondingly.

Rural trends in depression years: A survey of village-centered agricultural communities, 1930–1936, E. deS. Brunner and I. Lorge (*New York: Columbia Univ. Press, 1937, pp. XVI+387*).—This report of a third survey of 140 village-centered agricultural communities in the United States (E. S. R., 58, p. 385; 69, p. 299) opens with a summary of the basic changes in and adjustments of agriculture from 1930 to 1935, as shown by the census and illustrated in the communities studied. There follows an analysis of changes in population and in communities as such and in the relations of village to country. The discussion then turns to changes in institutions such as those of trade, industry, banking, education, religion, and social life. In connection with education, special attention is given to the rise of adult education during the depression years. Finally, consideration is given to the question of relief, a phenomenon previously almost nonexistent in these communities.

Family life cycle analysis, C. P. Loomis and C. H. Hamilton (*Social Forces, 15 (1936), No. 2, pp. 225–231, fig. 1*).—"Since our time is one of great change, it is doubtful if there are many farm areas in the western world where the cross-section method can give exactly a true picture of the life cycle of the farm family in the generalized sense. However, the comparative analysis here presented, even though supported by an insufficient number of cases, leads the authors to the conclusion that the cross-section method is useful in the analysis of family living data. In certain areas where there have been no great changes in social and biological factors affecting the family, a relatively accurate picture of the historical life cycle of the farm family may be secured by the make-shift method—the cross-section analysis."

The rural family, D. Sanderson (*Jour. Home Econ., 29 (1937), No. 4, pp. 223–228*).—In this abridgment of a lecture at Teachers College, Columbia University, the author emphasizes the need of giving consideration to the rural family, pointing out that the rural family, particularly the farm family, is much more vital than the urban family and also much larger and more stable.

The depression has called attention to the greater degree of security enjoyed by rural families. Over one-fifth more rural families own their own homes than do urban families. On farms, from one-third to one-half of the family living comes from the farm. Nearly 64.5 percent is in the form of food raised, about 30 percent is the value of house rent, and about 6 percent is in fuel.

The increasing urbanization of rural life is affecting the rural family as well as all other phases of rural culture. Birth rates are declining, paternal control is decreasing, and individual attitudes rather than familistic control are increasing. The changes in family life which are making for the better development of human personality are affecting the rural family, but this evolution will be slower in the country where family relationships will of necessity be adapted to the more elemental conditions of rural life.

Education of farm owners and tenants in Tennessee, C. E. Allred and B. D. Raskopf (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 25 (1937), pp. III+40, figs. 37*).—It is concluded that the educational status of farm operators in different areas of the State varies considerably in surveys made but a few years apart. In almost all of the 22 counties studied, over three-fourths of the white farm operators have not attended high school. This percentage is above 95 in 3 counties. The percentage of farm operators with no formal education whatever ranges from none in Madison County in 1920 to 29.5 in Monroe County in 1925. In a survey of Overton County in 1936 about

10 percent of the operators have not attended any school. Few of the operators in any of the surveys have attended college.

In practically every farm survey the educational status of white farm owners is higher than that of white farm tenants. The reverse appears to be true among Negroes, farm tenants being better schooled than owners.

Farm operators under 44 yr. of age have better education than those who are 45 yr. of age or older.

FOODS—HUMAN NUTRITION

The staling and keeping quality of bread, J. B. Hutchinson (*Res. Assoc. Brit. Flour-Millers Spec. Rpt. 15 (1936), pp. 27*).—The report consists of a detailed discussion of the research work on bread staling carried out in various countries and the results of investigations made in the laboratories of the association during the past year. An introduction and summary are given by E. A. Fisher. The following topics are discussed: Crust staling; crumb staling, which includes chemical staling and the development of crumbliness and hardness; keeping quality, which is characterized chiefly on staling by loss of aroma and flavor, the development of a dry sawdustlike taste and the actual hardness, crumbliness, and condition of the crumb at the time of eating; and the loss of water, or "drying out." The following practical aspects of the preservation of keeping quality are discussed: The refreshing of bread by heat, the use of hot and cold storage, the advantages of wrapping bread, and the influence of factors such as the kind of flour, the water absorption power, the mixing and manipulation of the dough, the type and degree of fermentation, the length of the baking period, and the addition to the flour or dough of substances which interfere with bread staling or act as bread improvers. None of the substances tested are recommended for use as satisfactory inhibitors of the staling process.

"In conclusion it may be emphasized once more that keeping quality is at a maximum in bread made from good flour of ample gassing power, good gluten content and quality with correct absorption, dough manipulation, and fermentation."

Relation of the age of bread to the amount eaten, M. C. Markley (*Northwest. Miller, 186 (1936), No. 1, p. 133; abs. in Minnesota Sta. Rpt. 1936, p. 31*).—The bread consumption is recorded of a family of five, including two adults and three small children, over a period of 7 weeks during which six loaves of bread, alternately white and graham, were delivered fresh from the oven once each week. The white flour used in both breads was a high protein spring wheat patent, which gives bread of very good keeping qualities, and the formula was of medium richness.

The average daily weights of bread consumed on the first day and for 4 consecutive days thereafter were 13.64, 9.34, 8.76, 8.21, and 7.42 oz., respectively. The decreased consumption of bread with increasing age is thought to afford one explanation for the general decline in bread consumption. Attention is called to the changes which have taken place in the commercial production and distribution of bread from the time of local bakeries with prompt delivery of unwrapped bread to the present system of centrally located plants distributing wrapped bread (necessitating a delay of several hours) over considerable distances. Improvements in the effectiveness of the distribution system so as to put fresher bread on the consumer's table is recommended as a means of increasing bread sales.

The availability of the proteins and inorganic salts of the green leaf, M. K. Horwitt, G. R. Cowgill, and L. B. Mendel (*Jour. Nutr., 12 (1936), No. 3, pp. 237–254, fig. 1*).—In a series of in vitro digestion experiments on dried

spinach, the validity of various food analysis technics was studied, and some modifications were devised.

A method of procedure for estimating the available nitrogen was devised, in which the fat-soluble nitrogen was eliminated by extraction with an alcohol-ether mixture and the nitrate, amide, and ammonia nitrogen were boiled off before determining the protein and amino acid nitrogen. The application of this method gave 3.85 percent available nitrogen as compared with 4.41 percent total nitrogen in the dried spinach tissue.

Chemical analyses gave the amounts of calcium, phosphorus, iron, and chloride in dried spinach as 1.016±0.006, 0.886±0.002, 0.0541±0.0002, and 1.267±0.004 percent, respectively. Determinations by digestion experiments, using various digestive agents, showed the following percentage amounts of available inorganic constituents present in dried spinach: 99.5 percent chloride, 8.6 calcium, 96.6 phosphorus, and 9 percent iron by water extraction; 29.1 percent calcium, 80.6 phosphorus, and 18.6 percent iron by N/10 hydrochloric acid; 30.5 percent calcium, 82.5 phosphorus, and 40 percent iron by N/10 hydrochloric acid plus pepsin; 100 percent chloride, 12.5 calcium, 90 phosphorus, and 24 percent iron by sodium bicarbonate plus trypsin; and 30.2 percent calcium, 89.9 phosphorus, and 40.6 percent iron by digestion with pepsin followed by trypsin. It is of interest to note that the addition of pepsin to the hydrochloric acid reagent increased the amount of iron available in spinach from approximately 20 to 40 percent.

The chemical composition and nutritive value of potatoes, M. E. WHALLEY (*Ottawa: Natl. Res. Council Canada, 1935, pp. 81*).—This mimeographed report presents a review of the literature, with 191 references.

Culinary quality of potatoes produced in Ohio, H. MCKAY and M. B. PATTON (*Ohio Sta. Bul. 579 (1937), pp. 98, 99*).—This is a progress report of studies on the effects of variety, type of soil, and time of planting on the culinary quality of potatoes. Data are included showing a definite positive correlation of the specific gravity of samples tested with scores for texture.

The composition of tubers of sprayed and unsprayed potato plants in relation to cooking quality, E. O. and M. T. MADER (*Amer. Potato Jour., 14 (1937), No. 2, pp. 56–59*).—These studies, reported from the [New York] Cornell Experiment Station, were made with the variety of potato known locally as Heavyweight, a potato of the Rural group, grown in western New York during the season of 1935. Samples were selected at random at intervals during the growing season from unsprayed plants and plants which had been sprayed with bordeaux mixture in amounts calculated to furnish a total of 74 lb. of copper to the acre during the season. The tubers were thoroughly cleaned, ground to a pulp with a food chopper, and well mixed before sampling. The analyses included total nitrogen, reducing sugars, sucrose, starch, copper, iron, crude fiber, and tyrosine.

On corresponding dates of sampling tubers from the sprayed plants showed higher percentages of sugars, starch, and copper and a lower percentage of total nitrogen than those of unsprayed plants. The amount of copper in the tubers from the sprayed plants decreased with successive sampling and that from the unsprayed increased. Analyses of samples on the date of final digging showed no great difference in dry weight, crude fiber, and ash content of the unsprayed and sprayed, but the tubers of the sprayed plants contained strikingly less tyrosine and iron than those from the unsprayed. The values on the dry basis (average of four analyses) were iron 0.0483 and 0.0715, and tyrosine 0.422 and 0.667 percent for the sprayed and unsprayed samples, respectively.

Inasmuch as it has been shown by Tinkler (E. S. R., 67, p. 183) that phenolic compounds (in this case tyrosine) and iron are partially responsible for the

blackening of cooked potatoes, the conclusion is drawn that spraying potato plants with bordeaux mixture is of value in counteracting this condition.

The problem of causes of blackening in cooked potatoes, W. E. Tottingham, R. Nagy, and A. F. Ross (*Amer. Potato Jour., 13 (1936), No. 11, pp. 297–309, figs. 4*).—In this investigation at the Wisconsin Experiment Station, the blackening of potatoes on cooking was found not to be correlated with immaturity, storage temperature, or degree of aeration. Slight differences in nitrogen content (1.87 percent of the dry matter of peeled tubers for those which blackened as compared with 1.69 percent for those which remained white) were found in the analyses of a considerable number of samples, but these averages were obtained from wide and overlapping ranges. The average amounts of free α-amino nitrogen, tyrosine, and tryptophan increased appreciably on cooking in the normal potatoes but remained about the same in those which blackened. The relative instability of the proteins in the abnormal potatoes, as suggested by these observations, was confirmed by the results obtained on mild hydrolytic treatment with sodium hydroxide and by enzyme hydrolysis of extracts of the potatoes. In each case the amount of tyrosine liberated was higher in the potatoes which blackened than in the normal samples. Sap from potatoes which blackened was found to be considerably more active in the oxidation of tyrosine into precursors of the pigment melanin.

Because of the known function of potassium as an agent in protein condensation reactions, a comparison was made of the available potassium content of the soil with the discoloration on boiling of potatoes in the 1935 crop. A general relation of discoloration to potassium deficiency in the soils was shown irrespective of the variety of the potato. This also held for potassium content of the potatoes grown in the greenhouse on a synthetic sandy soil, with and without heavy potash fertilizer. Samples containing less than 1.8 percent K_2O in the dry matter showed a general tendency to blacken after cooking.

Experimental results on the preservation of fruits and vegetables by freezing: A progress report, E. H. Wiegand (*Oregon Sta. Circ. 122 (1937), pp. 14*).—This publication, which is essentially a reprint of Circular 116 (E. S. R., 75, p. 719), has been issued in response to increasing demands for information. Of particular value to housewives are the frozen fruit pack and frozen vegetable pack tables, which summarize methods of preparation, types of container, and method of packing for berries, cherries, and other fruits, and various vegetables.

The use of honey as the sweetening ingredient in cakes, H. Morgan (*Jour. Home Econ., 29 (1937), No. 1, pp. 45–48*).—This investigation, carried on at the University of California at Davis, was made to determine the maximum amount of honey that would replace sugar in a basic plain cake formula, whether several varieties of California honeys could be used interchangeably, and whether cakes made with honey retain moisture longer than cakes made with sugar. The basic formula contained sugar 200 g, milk 206.3, fat (Crisco) 113.4, flour 210, baking powder (S. A. S. phosphate) 8.5, salt 3, vanilla 4.4, and eggs 92.1 g. It was estimated that 261.8 g of honey was equivalent to 1 cup of sugar, and that for each such substitution the amount of milk should be decreased by 46.3 g.

In preliminary tests with star-thistle honey the honey could be used in amounts up to 50 percent of the total sweetening without modifying the basic recipe other than adjusting the liquid ingredients, but above this level the cakes were heavy and yellow and had a pronounced astringent flavor. It was found that the undesirable qualities were due to the acidity of the honey and when this was exactly neutralized with soda cakes in which 75 and

100 percent of the total sweetening was honey could not be distinguished from those made with sugar.

Various California honeys were analyzed for free acid and then used in the same basic cake formula, with honey replacing 50 percent of the sugar and enough soda added to neutralize the acidity. There were no differences in texture and lightness, but the flavor of the cakes made with the strongly flavored honeys, such as resin weed, eucalyptus, buckwheat, star-thistle, and cotton, was less delicate than that with the milder flavored honeys. The addition of spices is recommended to improve the flavor of cakes made with the strongly flavored honeys.

Cakes made with honey were found to retain their moisture longer than those with sugar in proportion to the honey content. Regardless of the kind of honey the moisture content was highest on the third day after baking.

Decisions of courts in cases under the Federal Food and Drugs Act, M. G. WHITE and O. H. GATES (*Washington: U. S. Dept. Agr., 1934, pp. X+1546*).—This volume contains a compilation of approximately 370 court decisions and an accompanying digest. The Federal Food and Drugs Act of 1906 and amendatory and supplemental enactments are given in the introductory chapter.

Foods and drugs, E. R. TOBEY (*Maine Sta. Off. Insp. 163 (1937), pp. 143–156*).—The analytical data included in this annual report (E. S. R., 76, p. 272) consist chiefly of the results of an examination of 77 samples of oils used in packing sardines for refractive index at 25° C., percentage of free fatty acids, iodine number, and cold test.

Bacteriological examination of glassware or china for sanitary quality, C. R. FELLERS, A. S. LEVINE, and E. W. HARVEY (*Amer. Jour. Pub. Health, 26 (1936), No. 12, pp. 1211–1214*).—This contribution from the Massachusetts Experiment Station describes in detail a proposed standard swab method for the bacteriological determination of the sanitary quality of drinking glasses and utensils, with specific directions for preparing the sampling tubes, taking and handling the samples, and recording results.

It is said that if the technic is followed carefully from 40 to 80 percent of the organisms present are recovered, and that the method is sufficiently rapid and simple to be of use in a routine way by health laboratories in checking the sterilization of utensils in food and beverage dispensing establishments.

Nutrition investigations (*Connecticut [New Haven] Sta. Bul. 393 (1937), pp. 172, 173*).—This progress report (E. S. R., 75, p. 424) summarizes a comparison of the new salt mixture developed by the station with the Osborne-Mendel mixture as a constituent of various types of diets for experimental rats, a study of the effect of repeated pregnancies and lactations on the bone ash of mother rats, a repetition with modern type diets of the earlier experiments of Osborne and Mendel in which tryptophan and lysine were demonstrated to be essential constituents of the animal diet, and a continuation of the experiments, with the cooperation of L. G. Rowntree, on rats on the effects of injections of thymus extracts.

An improved technic for metabolism studies in pre-school children with a statistical determination of its reliability, J. E. HAWKS, M. DYE, and M. M. BRAY (*Jour. Nutr., 13 (1937), No. 1, pp. 51–64, fig. 1*).—In this contribution from the Michigan Experiment Station the technic followed in an extensive series of metabolic studies conducted on preschool children is described and discussed in considerable detail. The investigation was conducted in two experiments, the first on two boys 4½ yr. of age and the second on three girls 3 yr. and two boys 4 and 4½ yr. of age. The purpose was to find the variations in the nitrogen, calorie, and mineral utilization of children of this age receiving a con- [illegible] of protein per kilogram of body weight. The changes

in metabolism when the protein was increased to 4 g per kilogram of body weight, and the interrelationships between the utilization of the various substances.

Tabulated data are included on the physical measurements of the six subjects at the beginning and end of the experimental period, the diet calculations for the medium and high protein diets, and the range and variability in composition (calories, nitrogen, calcium, and phosphorus) of identical diets and of duplicate diets. The latter data show that in spite of great care in the sampling and analysis of foods the composition of the diets containing the same food and prepared under standard conditions varied not only from period to period but also between duplicate diets collected on the same day. The coefficients of variation ranged from 1.2 to 2.8 for the duplicate samples of the same diet and from 1.6 to 3.1 for identical diets.

"The variation in the composition of the food is an unavoidable part of every metabolism study, and it seems probable that the metabolic responses of the subjects would reflect these variations in diet. Since the differences would not be the same in successive experiments in one laboratory or in experiments in different laboratories, it is probably necessary to determine the fluctuations in every experiment."

Effect of diet on the constancy of the urinary nitrogenous constituents excreted daily by pre-school children, J. E. Hawks, M. M. Bray, and M. Dye (*Jour. Nutr., 13 (1937), No. 2, pp. 179–192, fig. 1*).—This paper reports the data obtained in the investigation noted above as to the urinary constituents following a 10- or 12-day preliminary period during 21 consecutive days when the children received 3 g of protein per kilogram of body weight and during the following 15 or 24 days when they received 4 g of protein per kilogram of body weight. The data, which are tabulated separately for the 3-g and 4-g protein periods but, combined for the two series, giving values for 5 children on the 3-g level and 6 on the 4-g level, are discussed chiefly from the standpoint of variability.

"Uric acid in one experiment and creatine in both were about twice as variable as diet nitrogen, while ammonia, acidity, and amino acid showed more irregularity. The increase in the protein content of the diet caused the value for total nitrogen, urea, ammonia, and creatine to be more variable, especially during the first 9 days. Then the figures reached an equilibrium similar to that on the first diet. Therefore, in this study a 9-day preliminary period seemed to be adequate. The change in diet did not seem to influence the variability of the data for acidity, uric acid, amino acid, or creatinine. Individual children tended to react in a similar manner both to the constant diet and to the change in the protein content of the diet."

Milk modification and infant constitution, I. N. Kugelmass (*New England Jour. Med., 215 (1936), No. 27, pp. 1285–1291*).—Comparative studies are reported on the relative value of various standard formulas and individualized formulas based upon the body build and condition of the individual infants in the group during the first 3 mo. of life. Each group consisted of from 50 to 60 infants, and the formulas included whole boiled milk, half-diluted boiled milk, evaporated milk in 1:2 dilution, and powdered whole milk and powdered lactic acid milk, respectively, in the proportion of 1 tablespoonful to 2 oz. of water. Each formula was reinforced with 10 percent carbohydrate, and orange juice and cod-liver oil were introduced in the third week in appropriate amounts. A group of breast-fed infants served as controls.

The maximum food consumption and maximum gains in weight were on the individualized formulas. Infants on breast feedings and on processed milk feedings gained more rapidly than those on fresh milk mixtures, and the least number of digestive disturbances was observed on breast feeding and on

individualized formulas. Infants of the linear type required about 70 calories per pound of body weight and tolerated concentrated mixtures, while those of the lateral type required only about 55 calories per pound and tolerated dilute mixtures better than concentrated.

In the author's opinion the type of feeding selected should be on the basis of the digestive capacity of the individual infant rather than the type which least utilizes digestive mechanisms, with fresh milk mixtures the choice for infants that can tolerate them and processed milk mixtures for those with diminished digestive capacity.

Milk allergy in elementary school children.—A preliminary report, D. A. WILLIAMS (*Brit. Med. Jour., No. 3960 (1936), pp. 1081, 1082*).—Among 150 school children who had refused or shown a disinclination to take milk supplied at school, 88 were found whose refusal was because of allergic manifestations of some kind following the ingestion of milk. In all but one of their families there was a history of allergy. There were 36 children who had no nausea or unfavorable symptoms after taking the milk, but who disliked it both at school and at home, and of these, all except 4 showed a personal or family history of allergy. Of the remaining children, 12 had no symptoms of allergy after consuming milk, but disliked the taste of the pasteurized milk, and 14 refused milk for various reasons unconnected with health or dislike of milk. Only 5 of the group of 12 and 2 of the group of 14 had a family history of allergy.

Although the number included in this preliminary investigation was admittedly too small to permit drawing definite conclusions, the results are considered significant enough to warrant caution in forcing milk upon children unwilling to take it. "While the popular movement to encourage the widespread consumption of milk has much to commend it, the fact that all people cannot take it with impunity should be remembered. Those who are allergic to it must avoid it or suffer."

An inquiry into the drinking habits of children of school age, with special reference to milk drinking, N. C. WRIGHT (*Hannah Dairy Res. Inst. Bul. 7 (1936), pp. IX+10–50, fig. 1*).—The information was collected by a memory test given to 13,317 school children. Of this number 52.7 percent did not drink any milk, 32.4 drank milk once daily, 11.6 twice, and 3.3 percent three times or more daily. Tea was taken at least once daily by 94.5 percent. For every time that milk was taken once the poor urban child took tea between 5 and 10 times, the artisan urban child 3 times, and the suburban child twice. Coffee and cocoa were taken rarely, as were beverages such as Oxo, Bovril, Ovaltine, and aerated and mineral waters. The relatively new milk-in-school scheme apparently has tended to popularize milk drinking.

Higher resistance of rats fed casein than those fed vegetable protein, E. S. ROBERTSON and M. E. DOYLE (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 3, pp. 374–376*).—The resistance of rats receiving an 18-hr. broth culture of *S[almonella] enteritidis* by intraperitoneal injection was studied. The diets contained cornstarch, Crisco, cod-liver oil, wheat germ, and salt mixture and from 13.1 to 13.9 percent of protein in the form of gluten, soybean, or casein. A definitely high resistance to infection was noted in the casein-fed rats and a low resistance in the gluten- and soybean-fed rats.

Further studies on the calcium content of the body in relation to the calcium and phosphorus content of the food, L. B. WHITCHER, L. E. BOOHER, and H. C. SHERMAN (*Jour. Biol. Chem., 115 (1936) No. 3, pp. 679–684*).—The authors studied the problem of optimal calcification in two series of experiments on rats. In series 1 the diets contained 0.43 percent of phosphorus and 0.53, 0.7, 0.84, or 1.04 percent of calcium, with calcium: phosphorus ratios of 1:2, 1:6, 2:0, and 2:4, respectively. In series 2 the diets contained 0.73

percent of phosphorus, with 0.55, 0.71, 0.89 or 1.05 percent of calcium and calcium : phosphorus ratios of 0 : 7, 1 : 0, 1 : 2, and 1 : 4, respectively. The relative nutritional effects of these diets through a considerable portion of the life history of the animals was compared in terms of growth, calcium content of the bodies, and skeletal development as measured by body lengths at definite ages.

The increased amounts of calcium in the diet did not bring about any distinct increase in the rate of calcification of the body, while the increased phosphorus induced only slight increases. The animals on the different dietaries showed no significant differences in body length at a given age.

Availability of iron in wheat, A. H. Free and F. C. Bing (*Soc. Expt. Biol. and Med. Proc., 35 (1936), No. 3, pp. 453, 454*).—Eleven samples of hard spring and soft winter wheats were analyzed for total and inorganic iron, using a modification of the Elvehjem technic (E. S. R., 71, p. 130) to determine inorganic iron and the thioglycolic acid method for total iron, as described by Hanzal (E. S. R., 70, p. 154). Biological assays were made on samples of Trumbull and Nabob soft winter wheats.

The total iron ranged from 2.9 to 4.87 mg and the inorganic iron from 2.46 to 4.04 mg per 100 g of wheat, an average of 81 percent of the total iron. Hemoglobin determinations made on the rats receiving wheat as a supplement to the anemia-producing milk diet demonstrated an actual increase in hemoglobin concentration for the 4-week period of from 9.1 to 10.1 g per 100 cc of blood, showing that the iron of wheat is well utilized for hemoglobin formation.

A comparison of oral administration versus intraperitoneal injection of colloidal iron upon blood regeneration in nutritional anemia of the rat, H. H. Beard and T. S. Boggess (*Amer. Jour. Physiol., 118 (1937), No. 2, pp. 211–216*).—Young rats made anemic by subsistence on a cow's milk diet containing an average of 0.11 mg of copper per liter were fed or injected intraperitoneally with different amounts of a colloidal copper-free iron preparation until blood regeneration was complete.

The injection of 2 mg of colloidal iron weekly for 4 weeks (8 mg) was as effective as the ingestion of the same amount daily by mouth for 3 weeks (42 mg). The injection of 0.26 mg every other day for 3 weeks (2.73 mg) was as effective as the ingestion of that amount daily for 5.5 weeks (10 mg). The utilization of colloidal iron by injection was 28 percent for the 8-mg dose and 87 percent for the 2.73-mg dose and by mouth was 6 percent for the 42-mg dose and 22 percent for the 10-mg dose. It is estimated that the minimum daily dose of injected iron required for hemoglobin regeneration is 0.13 mg. It is concluded that inorganic iron alone is very effective in blood regeneration in nutritional anemia of the rat.

Fluorides in Foochow waters and dental defects, T. H. Wang (*Jour. Chin. Chem. Soc., 4 (1936), No. 3, pp. 172–177, fig. 1*).—The fluorine content of 139 samples of water in Foochow was determined by the Sanchis method.

That the toxic concentration of fluorine is associated with dental defects was demonstrated by the presence of the deeply stained and pitted type of mottled enamel in the teeth of the villagers drinking water from the shallow wells having a fluorine content between 0.7 and 7 p. p. m. Hot spring water had a fluorine content averaging 9 p. p. m., deep hot water wells 9.6, and spring water 0.6 p. p. m.

Natural sources of fluorine and "mottled teeth" in Maldon, Essex, J. H. Bowes and M. M. Murray (*Nature [London], 137 (1936), No. 3472, p. 828*).—Data are tabulated on the fluorine content of samples of drinking water from London and from Maldon, Essex, the only region in England where mottled teeth had been recognized. Pond water from London contained 0.5 and from

Maldon 1.2 p. p. m. of fluorine, main water from London 0.5 and well water from Maldon 5 p. p. m. Samples of grass from London contained 0.0001 and from Maldon 0.0003 percent and the teeth of wild rabbits from Surrey 0.0053 and from Maldon 0.0283 percent.

"That very low concentrations of fluorine in drinking water can be effective might be explained by the fact that simultaneously fluorine is being ingested in plant and animal foodstuffs. Though such sources are less important, they should be considered as possible contributory sources. The reason why acquisition through the water supply has seemed to be the all important is no doubt due to the fact that the fluorine in water occurs as sodium fluoride, whereas in foodstuffs it more likely occurs combined with calcium, in which combination it is known to be less toxic."

Some observations on the development of the teeth of Cavia cobaya, M. T. Harman and A. Smith (*Anat. Rec., 66 (1936), No. 1, pp. 97–111, pls. 2*).—This investigation with normal guinea pigs from the earliest stage of formation until adult size was undertaken to establish a basis for comparison in the use of guinea pigs in nutrition studies, particularly vitamin C.

The material studied consisted of about 80 embryos varying in copulation age between 20 and 68 days and a number of postnatal animals from 1 to 40 days of age, both being studied by microtome sections and dissections made under the binocular microscope. The description of the chronological development of the teeth is supplemented by a number of microphotographs.

Liver oil from Dasyatis akijei: Vitamin contents, physical and chemical constants, T. H. Wang and C. H. Kan (*Jour. Chin. Chem. Soc., 4 (1936), No. 5, pp. 393–401, figs. 3*).—In addition to the analysis of the fatty acids content and the determination of physical and chemical constants of the liver oil of the fanfish (*D. akijei*), the vitamin A and D contents were determined biologically, following the procedure described by Tolle and Nelson (E. S. R., 67, p. 481) for vitamin A and the Steenbock-Black modification (E. S. R., 54, p. 489) of the line test for vitamin D. According to the international standards adopted in 1931, fanfish oil is a rich source of both vitamins, containing approximately 1,000 units of vitamin A and 200 units of vitamin D per gram.

Primary, secondary, and nonspecific effects in experimental vitamin A deficiency in rats [trans. title], T. Hart de Ruyter and O. Rosenthal (*Ztschr. Vitaminforsch., 5 (1936), No. 3, pp. 169–185, figs. 6; Fr., Eng. abs., pp. 184, 185*).—The findings in a histological study of Bartonella-free rats deprived of vitamin A are reported. It is concluded that the primary manifestations of vitamin A deficiency are the direct result of primary atrophy of the epithelium of the eye and of the mucous membranes of the digestive and urogenital tracts and of the lymphoid tissues. It is suggested that the lowered resistance to infection in vitamin A-deficient rats is due to the atrophy of the lymphoid tissues. Under the indirect secondary effects are listed Bartonella anemia in infected strains of rats and a disturbance of fat metabolism which is probably due to inanition.

Effect of various factors on the vitamin B_1 content of yeast, P. L. Pavcek, W. H. Peterson, and C. A. Elvehjem (*Jour. Bact., 33 (1937), No. 1, p. 100*).—The factors studied included three types of media, six strains of yeast, and certain conditions of growth, such as pH, temperature, aeration, etc. The yeasts were grown aseptically in kilogram batches and their vitamin B_1 values determined by biological assay on day-old chicks.

The yields of dry yeast, based on the sugar fermented, ranged from 24 (bakers' yeast B) to 40 percent (bakers' yeast A) on the wort medium; from 28 (*Saccharomyces logos*) to 43 percent (brewers' yeast) on the molasses medium; and from 12 (*Willia anomala*) to 29 percent (brewers' yeast) on the glucose-salts medium. Omitting aeration, raising the pH from 4.3 to 6.0, and

lowering the temperature from 30° to 20° C. decreased the yield of the bakers' yeast on which these factors were studied, with lack of aeration having the most pronounced effect.

Bakers' yeast contained approximately 10 international units of vitamin B_1 per gram of dried yeast when grown on the wort medium, 5 international units on the molasses-salt medium, and 3 international units on the synthetic medium in comparison with from 5 to 13 international units per gram of commercial bakers' yeast. Brewers' yeast, which ordinarily contains about 50 international units per gram, had about the same values as reported for bakers' yeast when grown on the above three media. Other strains gave similar values.

It is concluded that the composition of the medium is the most important factor in determining the vitamin B_1 content of yeasts.

The vitamin C content of the Porto Rico sweet potato, C. L. Newton and G. C. Lowry (*Jour. Home Econ., 29 (1937), No. 2, pp. 114–117*).—In this contribution from the Georgia Experiment Station, the authors determined the vitamin C content of the Porto Rico variety of sweetpotato grown for two consecutive years on clay loam soil and fed to the experimental animals when freshly dug or after curing by the usual home method in banks of earth and cornstalks. The guinea pigs received a slightly modified form of the Sherman basal diet supplemented by 5-, 10-, and 15-g portions of raw, boiled, and baked sweetpotato, cut so as to include a proportional amount of all parts and fed immediately.

The raw sweetpotato furnished almost complete protection at the 5-g level, indicating a content of slightly less than 0.2 Sherman unit of vitamin C per gram. The boiled sweetpotato was approximately equal to the raw, while the baked sweetpotato was about two-thirds as rich in vitamin C content. At the 10-g level mild scurvy was noted only in the animals receiving the baked potato, with the raw potato giving the highest weight gains. At the 15-g level all the animals were protected from scurvy, and for some inexplicable reason slightly higher weight gains resulted from the baked than from the boiled potato supplements.

Several months' storage seemed to have no appreciable effect on the vitamin C content, and no difference was noted in the content of sweetpotatoes harvested on the same farm in two consecutive years.

Ascorbic acid content of a number of citrus fruits, E. P. Daniel and M. B. Rutherford (*Jour. Agr. Res.* [*U. S.*], *54 (1937), No. 9, pp. 689–693*).—A number of citrus hybrids, which have been developed by the U. S. D. A. Bureau of Plant Industry as described in Circular 181 (E. S. R., 66, p. 830), were analyzed for ascorbic acid by the Bureau of Home Economics, fruits having been selected and shipped to Washington from the U. S. Horticultural Field Laboratory, Orlando, Fla., and analyzed as soon as possible after arrival.

The ascorbic acid values of the juices of eight varieties of oranges varied from 0.32 to 0.62 mg per cubic centimeter of juice. One of the three varieties of grapefruit had a value of 0.64 mg and the others ranged from 0.33 to 0.38 mg. Two samples of one variety of tangerine gave values of 0.18 and 0.24 and another variety 0.37 mg per cubic centimeter. The range in values for a tangelo (a grapefruit-tangerine hybrid) was from 0.18 to 0.64 mg and the average value for six samples of a single variety of tangor (a tangerine-orange hybrid) 0.4 mg per cubic centimeter. Of the few samples of tangerines, limequats (lime-kumquat hybrid), and orangequats (tangerine-kumquat hybrid) all had relatively low values, on the order of about half that of most of the varieties of oranges tested. Preliminary tests on Perrine lemons (a lemon-lime hybrid), picked both in the ripe yellow and light green stages and kept for 2 mo. in cold storage, indicated practically the same content of ascorbic

acid at the two stages of ripeness, 0.24 and 0.26 mg per cubic centimeter as compared with 0.4 mg per cubic centimeter for freshly picked fruit.

Vitamin C in citrus juices, season 1935–36, J. and T. Yofe (*Hadar, 9 (1936), No. 10, pp. 230, 231*).—The authors studied the amount of vitamin C in the 1935–36 crop of Palestine oranges obtained from one tree during a 3-mo. period, using the Tillmans method based on the titration of 2,6-dichlorophenolindophenol. The vitamin C content varied from 45 to 53.6 mg per 100 cc of juice during January, from 41.8 to 62.3 mg in February, and from 31.5 to 48.3 mg in March. No constant relationship was noted between the size of the fruit and the amount of vitamin C present in the juice.

Antiscorbutic value of South African mangoes, L. Levy (*Farming in So. Africa, 12 (1937), No. 131, p. 90*).—In continuation of previous investigations on the vitamin C content of South African products (E. S. R., 76, p. 429), the author determined the antiscorbutic value of 14 varieties of mangoes, using the Birch, Harris, and Ray modification (E. S. R., 69, p. 169) of the Tillmans method. The values obtained varied from 0.072 mg of ascorbic acid per cubic centimeter of juice from a fruit weighing 235 g of the Bombay Green variety to 1.29 mg from a fruit weighing 157 g of the Sabre variety. The concentration of the vitamin would appear to depend upon the variety rather than the size of the fruit.

The relation of vitamin C to the hemorrhagic diatheses, D. J. Stephens and E. E. Hawley (*Jour. Lab. and Clin. Med., 22 (1936), No. 2, pp. 173–179, figs. 2*).—The effect of large doses of orange juice was studied in four patients with hemophilia and in two patients with chronic thrombocytopenic purpura. In addition to the regular diet each patient received 100 or 200 mg of vitamin C daily. With one exception the usual diet contained an average amount of antiscorbutic foods. The cevitamic acid content of 24-hr. specimens of urine was determined by titration with 2,6-dichlorophenolindophenol according to the method described by Harris and Ray (E. S. R., 73, p. 427), and a modification of the apparatus described by Dalldorf (E. S. R., 70, p. 728) was used to determine capillary resistance. Coagulation and bleeding times were determined.

The case reports indicate that saturation with vitamin C had no demonstrable effect on the hemorrhagic manifestations, since in three patients with hemophilia and in one with thrombocytopenic purpura hemorrhages recurred or continued during the period when large amounts of orange juice were being administered. No significant changes in the number of platelets, bleeding time, clotting time, character of the clot, or in capillary resistance were observed. It is suggested that favorable therapeutic effects may be expected from the administration of vitamin C only in capillary bleeding associated with vitamin C deficiency.

Vitamin C and juvenile rheumatism, with some observations on the vitamin-C reserves in surgical tuberculosis, M. A. Abbasy, N. G. Hill, and L. J. Harris (*Lancet [London], 1936, II, No. 24, pp. 1413–1417, figs. 3*).—In continuation of previous studies (E. S. R., 74, p. 888), following the same method of determining vitamin C and considering an excretion of 13 mg of vitamin C per 10 stone (140 lb.) of body weight as the standard level of excretion, the authors studied 107 cases of active juvenile rheumatism and 86 cases in the convalescent period, with 64 normal individuals receiving the same institutional diet serving as control subjects. The dietary was liberal, with a vitamin C content well above the minimum standard of 25 mg per day per 140 lb. of body weight. Forty-two surgical and 46 quiescent surgical cases of tuberculosis were also studied.

On the basis of a 140-lb. body weight, the average excretion of vitamin C for the control subjects was 20 mg per day as compared with 9 mg for the active rheumatic and 10 mg for the convalescent rheumatic patients. The 23 cases

of surgical tuberculosis averaged 9 mg and the 46 cases of quiescent surgical tuberculosis 19 mg per day of vitamin C excreted from the body.

The administration of test doses of vitamin C confirmed the conclusion that the rheumatic subjects, both active and convalescent, were in a lower state of vitamin C saturation than were the control subjects. When the daily intake of vitamin C was increased by the addition of one-half orange per day per 14 lb. of body weight, the rheumatic subjects took longer to reach a given level of excretion than did the control subjects, and when after 5 weeks the new state of equilibrium had been reached, corresponding with the new diet, the new "resting level" for the rheumatic patients remained markedly below that for the controls. It would appear that "in the rheumatic subjects there is an increased need for vitamin C and probably an increased destruction in the body." This clinical evidence supports the view that vitamin C therapy is likely to be helpful in juvenile rheumatism, both as a prophylactic measure and in the curative treatment.

Recent observations on the biochemistry of the lens, D. R. CAMPBELL (*Brit. Med. Jour., No. 3961 (1936), pp. 1133–1136*).—In this review the newer methods of producing experimental cataract are discussed. Cataract in experimental animals appears to be inherited as a recessive characteristic and is associated with certain degenerative changes in the retina. In man the predisposition to cataract appears to be transmitted as a true dominant character, but with occasional lapses which are difficult to explain. A nutritive or endocrine disturbance may be an additional requisite factor. Present findings do not show any metabolic changes which may be associated with cataract in man except some slight evidence of a variation in blood calcium content, particularly in endocrine cataract. There is considerable evidence that vitamin C is an important factor.

A list of 40 references to the literature is appended.

The partition of reduced ascorbic acid in blood, D. J. STEPHENS and E. E. HAWLEY (*Jour. Biol. Chem., 115 (1936), No. 3, pp. 653–658*).—The reduced ascorbic acid content of whole blood, plasma, red blood cells, and white blood cells was determined by titration of trichloroacetic acid extracts with the indophenol reduction indicator according to the method of Birch, Harris, and Ray (E. S. R., 70, p. 741) in 11 leukemia patients, 15 with other diseases, and 4 normal subjects.

The reduced ascorbic acid content of whole blood in the patients with leukemia varied from 1.66 to 5.45 mg percent, in the normal subjects from 0.86 to 1.48, and in patients with other diseases from 0.66 to 1.23 mg percent. In the blood plasma the ranges were, respectively, from 0.91 to 3.75 mg percent, from 1.1 to 1.34, and from 0.7 to 1.2 mg percent; in the packed red blood cells from 0.76 to 6.47, from 0.84 to 1.19, and from 0.72 to 1.33 mg percent; and in the packed white blood cells from 8.12 to 75, from 8.65 to 26.4, and from 6.95 to 20.2 mg percent.

Scurvy as the result of dietetic treatment, R. PLATT (*Lancet [London], 1936, II, No. 7, pp. 366, 367*).—Records of 4 adults showing typical manifestations of developed scurvy are presented to illustrate the dangers of prolonged treatment with diets lacking in vitamin C. One patient was a neurotic woman who had placed herself on a diet, and the other 3 had been receiving dietetic treatment for peptic ulcer. Fruits and vegetables, except potatoes, were lacking in all the dietaries. Addition of tomato juice relieved the condition in 2 patients, and injections of redoxon were effective in the other 2 cases.

The antirachitic value of irradiated yeast in infants, T. G. H. DRAKE, F. F. TISDALL, and A. BROWN (*Jour. Nutr., 12 (1936), No. 5, pp. 527–533, pl. 1*).—The daily administration during 5 winter months of approximately 500 international vitamin D units in the form of irradiated yeast in cooked farina to 69 normally growing infants of British and northern European stock in Toronto, Canada,

prevented in every instance the development of rickets of a moderate or marked degree.

Definite healing of marked rickets in 1 infant was brought about by the daily administration of the irradiated yeast in amounts furnishing 1,000 international units of vitamin D, and of moderate or marked rickets in 4 infants by the administration of 500 units daily for 1 mo.

A study of the fecal flora and the line test of normal rats, rachitic rats, and healing rachitic rats, H. FRIEDMAN (*Jour. Nutr., 12 (1936), No. 2, pp. 165–172, figs. 3*).—This is a comparative study of the H-ion concentration and bacterial flora of feces of normal rats, rachitic rats, and rats which were healed of rickets by feeding irradiated ergosterol or vitamin D milks. The Steenbock ration No. 2965 was used, with the special sources of vitamin D being given from the nineteenth to the twenty-ninth days of the experimental period.

The results indicate that if the diet is known, the tendency toward rickets or healing in rachitic rats can be judged approximately by means of the basic or acid H-ion concentration of the feces, although the extent of the rickets and of the healing cannot be ascertained without the use of the line test or X-ray examination. When the H-ion reaction was acid, as in the normal and healing rats, the colonies found in the feces were acid-producing. When the H-ion reaction was basic, as in the rachitic rats, the colonies present in the feces were nonacid-producing. The feces of rachitic rats contained fewer *Bacillus coli* than did the feces of normal and healing rats. The addition of vitamin D milks and irradiated ergosterol caused increases in the number of *B. Coli* colonies in the feces.

The effect of vitamin D on intestinal atony of rickets, L. YODER (*Amer. Jour. Digest. Diseases and Nutr., 3 (1937), No. 11, pp. 828, 829*).—In previous studies conducted at the Iowa Experiment Station (E. S. R., 72, p. 822), it was found that the intestinal reduction of iron in deficient animals was decreased by feeding vitamin D and that the surface tension of the intestinal juice was also decreased by calcifying doses of the vitamin. In this contribution the author studied the effect of the ingestion of from 2.2 to 8.8 mg of viosterol upon the time required for the passage of food through the digestive tract of young rats receiving the Steenbock rickets-producing ration 2965. After 6 days or more on the diet, 1 percent of lampblack was incorporated into the ration and fed at the rate of 2 g per rat at intervals not exceeding the ordinary rate of consumption of the food, and the first appearance of black feces was noted.

The average decrease per litter in the time required for the passage of food through the digestive tracts of the rats receiving vitamin D was 26 percent. Larger amounts of vitamin D did not induce a proportionate decrease in the time of digestion. It would appear that there must be a minimal vitamin D requirement by the digestive tract for a tonicity which can maintain either a decreased intestinal volume or increased motility. "Thus, shorter digestion periods induced by the ingestion of vitamin D may account for the accompanying decreases in the intestinal reduction of iron."

The effect of vitamin D on intestinal iron reduction, L. YODER (*Amer. Jour. Digest. Diseases and Nutr., 3 (1937), No. 11, pp. 829–831, figs. 2*).—In continuation of the study noted above the author investigated the possibility of determining the decrease in iron reduction in the intestine of rachitic rats receiving vitamin D supplements as a test for vitamin D which might be correlated with both the lowering of intestinal alkalinity and the increased calcification of the bones which follow the ingestion of vitamin D by rachitic rats. A preliminary experiment showed that the effect of vitamin D upon iron reduction was more apparent in the expelled feces than within the digestive tract. Eighteen rats were placed on the Steenbock rachitogenic

ration 2965 supplemented by 0.5 percent of powdered hydrated ferric oxide. On the twenty-fifth to twenty-seventh days, six pairs were given as a supplement to the ration 1, 1.5, 2, 4, 8, and 16 mg, respectively, of viosterol per 100 g of ration for a 10-day period. Determinations of fecal pH and of the ratios of reduced iron to total iron were made.

The ratios of reduced iron and the H-ion concentrations showed similar trends, both being low at the start and showing higher and more constant values as the rickets progressed in the six animals not receiving vitamin D and in the two pairs receiving 1 and 1.5 mg of viosterol. The animals receiving increased amounts of the viosterol supplement showed a decrease in the fecal reduced iron, although bone calcification was noted only at the 8- and 16-mg levels. The reduced iron and the pH of the feces appeared to be more sensitive indicators of the presence of vitamin D than was bone calcification as shown by the line test.

Sprue—a clinical summary, A. C. Reed (*Amer. Jour. Trop. Med., 16 (1936), No. 5, pp. 499–526*).—Included in this discussion of sprue from the standpoint of distribution, predisposing causes, etiology, clinical picture, diagnosis, morbid anatomy, clinical pathology, and treatment is a discussion of the possible relationship of the disease to nutritional deficiencies. Evidence is cited of a conditioned deficiency involving the intrinsic gastric factor for pernicious anemia. To explain why, in the absence of this factor, sprue, pernicious anemia, combined degeneration of the cord, or pellagra may develop, the following suggestion is made:

"There must be another, at present unknown, element in the situation. This may be another deficiency, bacterial or virus infection, endocrine disturbance, or something else. If this unknown conditioning factor precipitates the functional pathology in the posterior tracts of the cord, the result is subacute myelinic degeneration; if in the skin and brain, it is pellagra; if in the blood-forming system, it is pernicious anemia; if in the alimentary tract, it is sprue."

Several case histories are given, and an extensive list of literature references is appended.

HOME MANAGEMENT AND EQUIPMENT

A study of ovens used for domestic cooking purposes, G. M. Redfield (*Indiana Sta. Bul. 416 (1936), pp. 20, figs. 12*).—The author compared the radiation losses, operation costs, and temperatures maintained under various conditions of operation, heat retention and distribution, the accuracy of thermostatic controls, and the thermal efficiencies of five standard electric range ovens, one gas range oven using city gas, the same oven equipped with conversion burners and used with bottled gas, and an oven specifically designed for use with bottled gas.

A measurable variation was noted in the radiation losses computed per 1,000 m^2 of inside oven surface. The electric ovens required less time for preheating and more energy than did the gas ovens, and also showed better heat retention. This indicates that cooking will continue longer after the heat is turned off in the electric ovens tested than in the gas ovens. In all ovens the heat was distributed fairly uniformly and without sufficient variation in temperatures in different parts of the oven to cause variations in the brownness of baked products. The thermal efficiencies in the electric ovens varied from 26.15 to 32.18 percent and in the gas ovens from 14.25 to 18.21 percent. The electric ovens required from 344 to 587 w to preheat to 325° F., from 256 to 485 w to maintain this temperature for 1 hr. with the oven empty, and from 435 to 656 w to bake a sponge cake. In the gas ovens the city gas range equipped with conversion burners required the least expenditure of heat units, followed by the regularly equipped bottled gas range and

the city gas range. The temperature variations for a given thermostat setting were found to be much greater in the electric than in the gas ovens. The gas ovens maintained a more even temperature than did the electric ovens, although either gave satisfactory results.

Introducing the electric range, M. M. Monroe and E. M. Cobb (*Maine Agr. Col. Ext. Bul. 222 (1936), pp. 18, figs. 7*).—In this bulletin are presented, in question and answer form, points for the housewife to know concerning the selection and use of an electric range and of cooking utensils.

Evaluation of certain factors affecting the cost of using utensils on electric heating units, M. M. Monroe (*Maine Sta. Bul. 386 (1937), pp. 53–155, figs. 23*).—The author studied the effect of the width of the pan in relation to that of the heating unit, the magnitude of variations in efficiency caused by differences in area of contact, the relative importance of contact between the utensil and the heating surface and the economy of black-bottom utensils as affected by the type of heating unit, the effect of the thermal efficiency of the utensil and heating unit upon the time of maintaining boiling with stored heat, the effect of polished aluminum v. black sides and cover and of the depth of the pan upon heat retention of a utensil, and of the design of a cover upon the amount of water evaporated during heating to boiling and during maintenance of boiling. A tentative study was also made of the relative economy of using duplicate and triplicate sets of saucepans on the same unit and of a "waterless" and a "well" cooker.

The findings are summarized separately for (1) the investigator of thermal efficiency of utensils used on electric heating units, (2) the manufacturer of cooking utensils and of electric heating units, and (3) the housewife as a guide to utensil selection. The last summary is an elaboration of the material contained in the bulletin noted above.

A supplement presents data on the differences in efficiency of utensils and heating units in terms of watt-hours and time required to heat the water and in the amount of water evaporated with a given heat input and in a given length of time during the maintenance of boiling.

MISCELLANEOUS

Report of the director [of the New Haven Station] for the year ending October 31, 1936, W. L. Slate (*Connecticut [New Haven] Sta. Bul. 393 (1937), pp. 161–213, fig. 1*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

The Forty-ninth Annual Report of the Maryland Agricultural Experiment Station [1936], H. J. Patterson (*Maryland Sta. Rpt. 1936 pp. XLVIII+690, figs. 89*).—In addition to experimental work previously noted or referred to elsewhere in this issue, this report includes reprints of Bulletins 378–396.

Forty-third Annual Report [of Minnesota Station], 1936, A. Boss (*Minnesota Sta. Rpt. 1936, pp. 74*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fiftieth Annual Report of [Nebraska Station, 1936], W. W. Burr (*Nebraska Sta. Rpt. [1936], pp. 64*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-fifth Annual Report of [Ohio Station], 1936, C. G. Williams et al. (*Ohio Sta. Bul. 579 (1937), pp. 140, figs. 16*).—The experimental work reported not previously referred to is for the most part noted elsewhere in this issue.

List of periodicals currently received in the Library of the United States Department of Agriculture, June 1, 1936, compiled by E. G. Hopper (*U. S. Dept. Agr., Misc. Pub. 245 (1936), pp. IV+337*).—This list, arranged both alphabetically and by subjects, supersedes earlier compilations (E. S. R., 13, p. 1107; 22, p. 595; 48, p. 694.)

NOTES

Connecticut College and State Station.—B. W. Ellis, director of the extension service, has resigned to engage in farming and has been succeeded by Dr. Roger B. Corbett, senior extension economist of the U. S. D. A. Extension Service.

Dr. George P. Clinton, whose retirement on July 1 as botanist of the State station has been recently noted (E. S. R., 77, p. 432), died August 13 at the age of 70 years. A native of Illinois, he received the B. S. degree from the University of Illinois in 1890 and the M. S. degree in 1894, as well as the M. S. degree from Harvard University in 1901 and the D. Sc. degree in 1902. He served as assistant botanist in the Illinois University and Station from 1894–1900, beginning his work in Connecticut in 1902. In addition to 35 years' continuous service in the station, he was also lecturer in forest pathology in Yale University from 1915 to 1926, and from 1926 to 1929 research associate.

Dr. Clinton was widely known for his many contributions to phytopathological research. He had given special attention to cereal diseases caused by the smuts, tobacco mosaic, the combating of downy mildew, and white pine blister rust, and he was the author of a long list of publications on these and related subjects. He was a member of the National Academy of Sciences, president of the American Phytopathological Society in 1912, and chairman of Section G of the American Association for the Advancement of Science in 1914.

Iowa College and Station.—Dr. Percy E. Brown, associated with the agronomy work of the institution since 1910 and head of the department since 1932, died July 7 at the age of 53 years. A native of New Jersey and the recipient of the B. S., M. A., and Ph. D. degrees from Rutgers University, he served as assistant soil chemist in the New Jersey Stations from 1906 to 1910. In Iowa he gave early and detailed attention to soil bacteriology and soil management, including the development of the soil survey. He had long been active in the American Society of Agronomy, serving continuously as secretary-treasurer since 1920 except for the year 1932 when he was president, and was very successful in upbuilding the membership and finances of that organization. At the time of his death he was also chairman of Section O, Agriculture, of the American Association for the Advancement of Science and editor of the *Iowa State College Journal of Science.*

Massachusetts College and Station.—Dr. F. H. Hesselink van Suchtelen, associate professor of microbiology and research microbiologist from 1913 to 1918, died at Apeldoorn, Netherlands, June 23 at the age of 53 years. He had also served in 1911 and 1912 as research associate in bacteriology in the Michigan Station.

New Mexico College and Station.—Wilson Hall, built in 1907 and housing the departments of agricultural economics, home economics research, and irrigation and the cotton improvement work, was completely destroyed by fire September 5, with much loss of valuable equipment and records.

South Dakota College and Station.—A. M. Eberle, director of the extension service, has been appointed vice dean of agriculture. I. B. Johnson, extension animal husbandman, has been appointed vice director of the station and associate professor of animal husbandry.

EXPERIMENT STATION RECORD

VOL. 77 DECEMBER 1937 No. 6

"BETTER PLANTS AND ANIMALS: A SURVEY OF SUPERIOR GERM PLASM"

Under the above title, the Federal Department of Agriculture has just issued the second and concluding installment of what is thought to be the first comprehensive effort to survey superior germ plasm in the leading farm plants and animals. Undertaken for publication as the dominating theme in the Yearbook of the Department for 1936, the amount of material assembled proved to be so extensive as to occupy not only over 1,000 pages of that volume but more than 1,300 pages in the Yearbook for 1937, as well as several articles and bibliographies omitted for lack of space but available as 1937 Yearbook separates. Taken as a whole, it undoubtedly constitutes the most complete account of the current status of breeding work and genetic research in relation to farm plants and animals which has thus far been prepared. In the words of its sponsor, Secretary Henry A. Wallace, it epitomizes "how much we know and also how much more we should know."

The project was under the direction of a special committee of the Department appointed by the Secretary in 1933 to make "a national and to some extent an international survey of practical breeding and genetic research with those plants and animals that are important in American farming." The first fruits of the work appeared in the 1936 Yearbook as a series of 20 papers dealing chiefly with the major crop plants and classes of livestock. The final contribution, now at hand, is supplementary, covering in 41 papers the broad and varied field remaining. A glossary of genetic terms, a chronology of genetics, and a detailed index are included in the two volumes.

Much of the material was collected through questionnaires designed to survey the work being carried on in all State agricultural experiment stations, similar public institutions abroad, and to some extent in private or endowed institutions and by individuals. The preparation of the papers was assigned to Department specialists, who have not only summarized the information obtained from the survey but have drawn on their own experience and knowledge and the whole field of technical literature. An effort has been made to interest and

inform both the general and the advanced reader. Much space has been given to data showing the organization and status of research projects under way, and lists are appended of plants with superior germ plasm available for future breeding work.

As a foreword by Secretary Wallace points out, "the science of the quality of life as it passes from generation to generation is in many respects the greatest and youngest of all the sciences." The art of plant and animal breeding is an old one, but the science of plant and animal genetics began with the present century. The Yearbooks reveal how rapid and far reaching have been its accomplishments. In the case of plants especially, there have been developed out of the old stock a large number of new forms with better quality, more productiveness, and greater resistance to disease and adversity. Among the outstanding achievements for fruits and vegetables alone which are cited are "the development of the wilt-resistant Marglobe tomato, which is now widely grown and saved the Florida producers from ruin; strains of cantaloups resistant to powdery mildew and of lettuce resistant to brown blight and powdery mildew—both of vital importance to California growers; snap beans resistant to some of the chief diseases that plague producers; cabbages resistant to yellows; sweet corn of such uniform and superior quality that it has remade canning practices; superior varieties of raspberries; blueberries far better than those produced by nature; a large number of improved navel oranges from bud selections; and many interesting new fruits created by hybridizing different kinds of citrus."

Nevertheless, it is made clear that geneticists "would be the first to say that they have hardly scratched the surface. . . . Looking into the future they can see far richer possibilities as their science pushes forward with its exploration and experimenting." One of the major purposes of the survey was to attempt "a frank appraisal of the present situation on a major segment of the agricultural front—not only to sum up achievements but to expose weaknesses and shortcomings. . . . In almost every case, it is shown that we are far short of attaining the objectives that scientists believe we may attain with means as potent as genetics."

As a result of their survey, the authors believe that it is "both heartening to discover how much has been accomplished and humbling to realize how little we know." This would seem to reveal a desirable state of mind. They suggest that not only has the survey been worth while but that it would be well if a similar audit or stock taking could be made in other major branches of agricultural sciences, and they announce that such a plan is now projected in the Department. Doubtless it will be very useful.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the Idaho Station], H. P. Magnuson (*Idaho Sta. Bul. 221 (1937), pp. 9, 10*).—The station has found the carotene content of pasture grasses to be well preserved during shipment by freezing in "dry ice", the samples having been ground on arrival at the main station in a Wiley mill with excess of the solid carbon dioxide. Notes are also given on some technical phases of potato alcohol production.

[Chemical and bacteriological investigations by the Massachusetts Station] (*Massachusetts Sta. Bul. 339 (1937), pp. 23, 24, 32, 33, 34, 35*).—Results are noted on the influence of bile and bile salts on *Aerobacter aerogenes*, by J. E. Fuller; lipolytic activity of Gram-negative intestinal bacteria, by Fuller and E. W. Harvey; the tolerance of the *coli-aerogenes* group for brilliant green and a study of the Eijkman test, both by R. L. France; the action of the *coli-aerogenes* group on erythrosin, by France and Fuller; a new method for determining iodine in foodstuffs; hemicelluloses of tobacco stalks, by E. Bennett; and methods for determining the fate of certain constituents of vegetables during cooking, by M. E. Freeman.

[Chemical work of the Puerto Rico College Station], R. Arroyo (*Puerto Rico Col. Sta. Rpt. 1935, pp. 12, 13, 52–54*).—The report notes the progress of work on the bacterial production of *n*-butyric acid from sugarcane final molasses (more than 90 percent of the theoretical quantity of practically pure butyric acid having been obtained) and on the preparation of high-grade cellulose from sugarcane bagasse.

A bacterium that does a "Dr. Jekyl-Mr. Hyde" act, C. S. Pederson (*Farm Res. [New York State Sta.], 3 (1937), No. 4, pp. 2, 5, figs. 3*).—The author presents a popular description of an organism (a *Leuconostoc*) growing in chains in laboratory media but in an encapsulated form in sugar solutions. In commercial sugar solutions a slimy product, largely a dextran, is formed. The organism is not only desirable but necessary, however, in the preparation of sauerkraut, in which it has been shown to be the cause of the primary fermentation. It is also used for the preparation of an acid alcoholic beverage from pineapple juice in the Philippines.

Vitamin P: Flavonols as vitamins, S. Rusznyák and A. Szent-Györgyi (*Nature [London], 138 (1936), No. 3479, p. 27*).—It is noted briefly that the authors in collaboration with L. Armentano and A. Bentsáth, have found ascorbic acid to be ineffective but vitamin C-rich extracts of Hungarian red pepper and lemon juice effective in the treatment of certain pathological conditions characterized by permeability or fragility of the capillary wall. Fractionation of the extracts resulted in the separation of the active substance in the fraction consisting of practically pure flavone or flavonol glycoside. Daily intravenous injections of 40 mg of this fraction restored normal capillary resistance in 2 weeks in patients suffering from permeability of the capillary walls, with spontaneous bleeding. The name vitamin P is proposed for the substance responsible for the action on vascular permeability.

Vitamin nature of flavones, A. Bentsáth, S. Rusznyák, and A. Szent-Györgyi (*Nature [London], 138 (1936), No. 3497, p. 798, fig. 1*).—Further evidence is given of the vitamin nature of the flavones tentatively termed vitamin P. Weight curves are shown of groups of guinea pigs receiving a scurvy-producing diet, with and without the addition of "citrin", the crystalline flavone fraction from lemon juice. In 17 animals receiving the diet without the addition, death occurred on an average of 28.5 days, with average weight declines from 359 to 242 g. In 21 animals receiving as a supplement 1 mg of citrin daily, none had died at the time, 34–38 days, when all of the first group were dead. The weight levels had fallen from an average initial weight of 365 to 342 g. All of the animals in both groups showed typical symptoms of scurvy in fragility of the bones, loosening of the teeth, and swelling of the joints, but the number of hemorrhages noted on autopsy was very much greater in the first group than in the one receiving citrin. "These results suggest that experimental scurvy, as commonly known, is a deficiency disease caused by the combined lack of vitamin C and P."

Chemical nature of citrin, V. Bruckner and A. Szent-Györgyi (*Nature [London], 138 (1936), No. 3503, p. 1057*).—Further work on the crystalline flavone fraction of lemon juice capable of curing disorders of the capillary wall and termed citrin has shown it to consist of mixed crystals of two different dyes. One of these, hesperidin, m. p. 261° [C.], forms the major part of citrin, but the activity and color reactions of citrin are due to the other component, eriodictyol glucoside, a demethylated hesperidin. The active eriodictyol glucoside was not found in any considerable quantity in unripe oranges, while hesperidin was present in considerable amounts. The probability is suggested that eriodictyol glucoside is formed from hesperidin by demethylation during the ripening of the fruit.

From vitamin C to vitamin P, A. Szent-Györgyi (*Cur. Sci. [India], 5 (1936), No. 6, pp. 285, 286*).—The author gives a brief historical review of the steps leading up to his isolation of vitamin C, ascorbic acid, and more recently of the flavone, vitamin P, responsible for inducing the reaction between peroxidase and ascorbic acid and capable of curing disorders of the capillary wall, such as hemorrhagic diathesis of the vascular type.

Ascorbic acid oxidase and the state of ascorbic acid in vegetable tissues, W. Stone (*Biochem. Jour., 31 (1937), No. 4, pp. 508–512*).—Following a brief review of the literature reporting the presence of enzymes in certain plant materials capable of oxidizing ascorbic acid, data are reported on the apparent presence of such an enzyme in various fruit and vegetable juices.

Bananas, cabbage, carrots, cucumbers, vegetable marrow, potatoes, and string beans lost practically all of their indophenol-reducing power on mincing in the absence of metaphosphoric acid, but the property was restored with hydrogen sulfide in all the materials except cabbage. Under identical treatment cantaloup, lettuce, alfalfa, onions, green peas, spinach, and watermelon did not lose their indophenol-reducing property. The materials in the first group destroyed the reducing power of orange juice, while the others did not. Cucumber juice was mixed in varying proportions with orange juice containing 0.4 mg of ascorbic acid and incubated at 37° C. for 10 min., after which ascorbic acid determinations were made. The extent of destruction was shown to increase with increasing proportions of cucumber to orange juice, varying from 78 percent in the mixture of 5 volumes of orange juice to 0.5 of cucumber juice to 100 percent in mixtures of 2.5 volumes of orange juice to 5 of cucumber juice. The orange juice by itself lost no ascorbic acid by the treatment. In several tests with solutions of ascorbic acid instead of orange juice there was a destruc-

tion of about 27 percent under the conditions of the experiment with no added cucumber juice. This increased to 100 percent in mixtures of 5 cc of ascorbic acid containing 2.5 mg mixed with 5 cc of cucumber juice.

It is concluded that there is no dehydroascorbic acid in the intact vegetable tissue, but that this is formed when a cut or crushed vegetable containing the enzyme is exposed to air.

A supplementary note calls attention to the paper of Kertesz, Dearborn, and Mack (E. S. R., 77, p. 151) in which some of the vegetables found in the present study to contain no oxidase were reported to contain small amounts which act after a long time. To test this, lettuce, onions, fresh green peas, and spinach were tested before and after standing for 3 hr. at 37°. In no case were higher values obtained with the heated than the unheated juice and in three cases the values were actually lower. The enormous loss in spinach, 85 percent in the unheated and 91 percent in the heated juice, and the high loss in lettuce, 57 and 75 percent, respectively, are considered nonenzymic and attributed to the high iron and copper content of these vegetables. "This loss in spinach is of great importance because the mode of preparation of this vegetable for consumption is very conducive to the destruction of its excellent vitimin C content. In order to minimize this loss it should be served immediately after cooking."

The oxidation of l-ascorbic acid by plant enzymes, S. W. Johnson and S. S. Zilva (*Biochem. Jour., 31 (1937), No. 3, pp. 438–453*).—This paper reports a comparative study of the enzymic reversible oxidation of ascorbic acid by various plant food materials, as determined either on the juice or an enzyme prepared from the plant material. The juice was obtained by pressing between porcelain plates in a hand mill the material previously frozen at −20° C. If in a sample of the fresh juice adjusted to pH 7.6–8 a precipitate formed, the remainder of the juice was treated in the same way and readjusted to the original pH after removing the precipitate. The enzyme material was prepared according to the procedure of Szent-Györgyi involving precipitation by saturation with ammonium sulfate after removing impurities with barium acetate and excess of the latter with saturated ammonium sulfate, dissolving the precipitate from 100 cc of juice in 50 cc of M/15 KH_2PO_4 or M/5 sodium acetate (pH 6). Tests were made of the pH range of activity and sensitivity to cyanide, the aerobic nature of the enzyme activity as determined by comparison with methylene blue as hydrogen acceptor, the action of the enzyme on mono- and dihydricphenols and on ascorbic acid in the presence of catechol, and the peroxidase activity of both juice and enzymes.

Cabbage, cauliflower, cucumber, and vegetable marrow appeared to contain an enzyme which oxidizes *l*-ascorbic acid and *d*-glucoascorbic acid directly, but does not oxidize mono- or dihydricphenols. The apple and the potato did not contain such an enzyme but were able to hydrogenate ascorbic acid indirectly by previously oxidizing mono- and polyhydricphenols, if present, to their corresponding quinols, which in their turn oxidize ascorbic acid. The juices of the first group were able to oxidize catechol as well as ascorbic acid. When both were present the oxidation of catechol began only after the oxidation of ascorbic acid had been completed.

The oxidation of vitamin C, C. R. Addinall (*Merck Rpt., 46 (1937), No. 2, pp. 4–6; abs. in Amer. Jour. Pharm., 109 (1937), No. 4, pp. 188–190*).—A brief summary is given of the reducing properties of vitamin C, with particular reference to its chemical determination in foods and biological material.

The two steps in the oxidation of vitamin C are given as (1) ascorbic acid ⇌ dehydroascorbic acid and (2) dehydroascorbic acid → *l*-threonic acid, oxalic

acid, and CO_2. In the presence of atmospheric oxygen and in acid and neutral solution ascorbic acid is slowly oxidized. At pH <4 oxidation stops at the first stage and can be reversed with H_2S. With increased alkalinity oxidation is greatly hastened and in the presence of sufficient oxygen ends at the second stage. Oxidation is hastened by minute traces of copper and oxidases and is retarded by salts, biological extracts, and erythrocytes.

Dehydroascorbic acid at pH >4 undergoes spontaneous irreversible transformation into an acid with no antiscorbutic activity, the change being independent of air or oxidizing agents. Dehydroascorbic acid has high potency in vivo because of the reducing action of glutathione in the tissues converting it into ascorbic acid.

In crystalline form ascorbic acid is stable on exposure to air. In aqueous solution it gradually oxidizes. One-percent solutions are reported to have lost only 14 percent of their activity after a week's time. Neutralized solutions are more liable to oxidation, but solutions in sealed ampoules under an inert gas are stable indefinitely. In the human body the vitamin is rapidly carried to the tissues and maintained in the reduced active form until excreted in the urine.

"With due regard to interfering substances, and within the acid range indicated by the modification of Birch, Harris, and Ray, the Tillmans reaction gives a reasonable evaluation of the vitamin C content of biological material, but clinical findings must necessarily take into account the yet unsolved problems of metabolism and of the formation of physiologically inactive oxidation products with reducing properties. In the ultimate analysis, where it is not possible to isolate crystalline ascorbic acid from the test material, the biological assay is still the safest indication of the antiscorbutic action of material containing vitamin C."

A specific reaction for the qualitative and quantitative determination of ascorbic acid in serum, H. Lund and H. Lieck (*Nature [London], 137 (1936), No. 3471, p. 784*).—The methylene blue reaction with ascorbic acid has been applied to its determination in very small amounts of blood serum. The examination is made with a stock solution consisting of KH_2PO_4 9 g, NaCl 2 g, with 0.004 percent methylene blue solution in 100 cc. To 0.9 cc serum, 0.1 cc of this solution is added. The mixture is exposed to the light of a 100-w Nitra lamp, at a distance of 1 cm for 30 sec., and the intensity of the color is compared to that of a control. Fading of the intensity of color is distinct even with 0.1 mg percent. The color change is reversible in the dark.

The method is said to have no interference from glutamine, ergothionine, creatine, creatinine, urea, adenine, guanine, hypoxanthine, xanthine, uric acid, cystine, phenol, or hemoglobin. A negative reaction becomes strongly positive after the ingestion of 500 mg ascorbic acid. With modification it is thought to be suitable also for the determination of the ascorbic acid content of milk and urine.

Method for the determination of serum ascorbic acid with capillary blood [trans. title], A. Elmby and T. K. With (*Klin. Wchnschr., 16 (1937), No. 21, pp. 746–748, figs. 5*).—A special pipette has been devised to adapt the methylene blue titration method of Lund and Lieck noted above to microdeterminations requiring only from 0.1 to 0.2 cc of capillary blood from the ear lobe or fingertip. The instrument is described with diagram, the method is outlined briefly, and data obtained with the micromethod and the macromethod for comparison are reported. It is shown to be capable of detecting 0.2γ of ascorbic acid dissolved in 1 cc and to be practicable for the determination of vitamin C saturation following test doses.

Estimation of ascorbic acid (vitamin C) by titration, IMRE GÁL (*Nature [London], 138 (1936), No. 3497, p. 799*).—A slight modification of the Martini and Bonsignore methylene blue method (E. S. R., 73, p. 746) for determining ascorbic acid is described. This consists in the use of titanium trichloride in dilution of 5 in 1,000 to titrate any excess methylene blue remaining after the reaction with ascorbic acid. The titanium trichloride solution should always be freshly prepared and standardized against the standard methylene blue. To the metaphosphoric acid solution of the material to be examined for its ascorbic acid content, the methylene blue solution is added until after exposure to intense sunlight or to a 300-w lamp the color of the solution being titrated no longer changes. The solution is then titrated with titanium trichloride and the difference between the two values represents the ascorbic acid.

In the estimation of oxidized ascorbic acid the mercuric acetate technic of Emmerie (E. S. R., 72, p. 443) can be used if care is taken to remove hydrogen sulfide by carrying out the reaction in a stream of carbon dioxide.

Estimation of ascorbic acid (vitamin C) by titration, H. CHEFTEL and M. L. PIGEAUD (*Nature [London], 138 (1936), No. 3497, p. 799*).—It is noted briefly that in determining ascorbic acid by the Harris and Ray modification of the Tillmans method the necessity for very rapid titration can be obviated by cooling the ascorbic acid solution to 0° C. and carrying out the titration at this temperature.

Metaphosphoric acid in the extraction and titration of vitamin C, R. R. MUSULIN and C. G. KING (*Jour. Biol. Chem., 116 (1936), No. 1, pp. 409–413*).—"The titration procedure of Bessey and King [E. S. R., 71, p. 137] for the determination of vitamin C has been modified to include the presence of 2 percent metaphosphoric acid with acetic acid or trichloroacetic acid during extraction and titration The modified procedure is advantageous for work with both plant and animal tissues.

"Metaphosphoric acid in approximately 2 percent concentration, as suggested by Fujita and Iwatake [E. S. R., 76, p. 155], serves to protect vitamin C in solution against atmospheric oxidation, even in the presence of added copper, and also exerts protective action against oxidation in the presence of trichloroacetic acid. The rate of reaction with 2,6-dichlorophenolindophenol is not appreciably affected by the presence of metaphosphoric acid."

Report on biological methods for vitamin B complexes, C. A. ELVEHJEM (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 354–356*).—A report from the Wisconsin Experiment Station very briefly outlines a method capable of showing the vitamin B_1 potency of yeast samples. "It is recommended that the proposed method be studied in greater detail and collaboratively."

Soil and plant material analyses by rapid chemical methods, II, F. E. HANCE (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 41 [1937], No. 2, pp. 135–186, pls. 2, figs. 20; also Hawaii. Sugar Planters' Sta., Agr. and Chem. Bul. 51 (1937) pp. 135+186, pls. 2, figs. 20*).—This paper supplements a previous article (E. S. R., 76, p. 438) describing rapid chemical methods of analysis "which are applicable to agricultural-chemical studies of soils, waters, plant materials, and mill byproducts." It also deals with "the application, preparation, use, and care of durable color standards for rapid colorimetric analyses."

A comparative study of certain presumptive media for testing raw waters, R. L. FRANCE (*Jour. Amer. Water Works Assoc., 28 (1936), No. 6, pp. 785–793; abs. in Massachusetts Sta. Bul. 339 (1937), p. 96*).—This contribution from the Massachusetts Experiment Station records the results of an investigation in which it was shown in part that the use of lactose broth with confirmation of all positive presumptive tubes by inoculation into secondary tubes

of brilliant-green bile broth gave the highest total number of recoveries of the *coli-aerogenes* group from the raw waters tested. The results indicate that this method may prove the most satisfactory for testing raw polluted waters.

Speed and accuracy in determination of total nitrogen: The use of selenium and other catalysts, A. E. Murneek and P. H. Heinze (*Missouri Sta. Res. Bul. 261 (1937), pp. 8*).—In the experiments here reported, the catalysts had little effect on the exactness of the determination of the nitrogen content of plant and soil samples, but they markedly increased the rate of digestion.

"The sample, varying from 0.5 to 10 g according to the nitrogen content, is placed in a 800-cc Kjeldahl flask, 30 cc of concentrated H_2SO_4, containing 1 g of salicylic acid, is added and the contents thoroughly shaken and preferably allowed to stand overnight. Then 5 g $Na_2S_2O_3$ is added and the flask heated slowly for 5 to 10 min. Ten g of anhydrous Na_2SO_4 and the catalysts, consisting of 0.1 g selenium, 0.25 g $CuSO_4$, and 0.7 g HgO, are added, and the digestion continued till the total digestion time is approximately 1.5 times the clearing time for each sample. When cool, 300 cc of distilled water is poured into the flask, and enough concentrated NaOH (1 g per cubic centimeter of H_2O), containing 1 g Na_2S for every 75 cc, is added to neutralize the acid and make the solution strongly alkaline. About 1.5 g of 20-mesh zinc is used to prevent bumping during the distillation.

"The use of the catalysts may be simplified by preparing a mixture of the three materials in the following proportion by weight: 10 of selenium, 25 of $CuSO_4$, and 70 of HgO. The $CuSO_4$ must be finely ground and the selenium and HgO thoroughly mixed with it. By using 1.05 g of this mixture the above mentioned amounts will be added."

Report on carbohydrates in plants: Study of the permanganate titration method for copper, J. T. Sullivan (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 382–386*).—This report, contributed from the Indiana Experiment Station, takes up a study of the end point in the titration by permanganate of the copper reduced by sugar solutions.

"The addition of a drop of orthophenanthroline indicator to the copper solution before titration seems to eliminate the personal factor in the reading of the end point. The change in color is sharp and distinct and may easily be limited to a single drop of 0.05 N potassium permanganate. If the temperature is too high (80° C.), the color of the indicator fades before the end point is reached, and in this case more indicator must be added. A warm solution is necessary for titration; 60° or above has always been recommended. It is most important in an accurate titration to have all the copper in solution. Though heat may assist this solution, it is safer to press out each particle with a rod, and it is unsafe to depend upon stirring alone. With careful manipulation the results with dextrose should agree with the electrolytic method."

The estimation of starch in plants with special reference to woody plants, J. T. Sullivan (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 4, pp. 621–636, fig. 1*).—A procedure described in a contribution from the Indiana Experiment Station is based upon the extraction of the starch with slightly alkaline calcium chloride solution and its precipitation by iodine. The difficulties encountered in precipitating the starch iodide in the presence of calcium chloride are avoided by removing the calcium chloride and substituting ammonium sulfate as the flocculating agent. The double precipitation necessary tends to purify the starch precipitate.

"The conditions that must be observed in order to obtain the maximum yield of starch by one extraction involve the concentration of the calcium

chloride, the duration of the boiling, and the degree of fineness to which the sample is ground. When the proper conditions are used, the yield of starch obtained by one extraction agrees with that obtained by successive extractions under less drastic conditions. This indicates that all the starch has been brought into solution.

"Recovery of potato starch alone or when added to plant material indicates that no starch is lost during the process. The quantities of starch obtained by this method represent the true starch values more closely than those obtained by enzymatic methods."

Report on gums in foods, L. J. Cross (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 432, 433*).—A report contributed from the New York State Experiment Station presents the results of a trial by 10 collaborators of a method for detecting gums in cream cheese samples. In samples containing, respectively, about 0.1 percent, about 0.05 percent, and no added gum or agar, 9 analysts found the gum present in the first sample, 10 in the second sample, and 8 out of the 10 found gum to be absent from the third sample.

Report on refractometric determination of oil in seeds, T. H. Hopper (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 433, 434*).—A report contributed from the North Dakota Experiment Station notes that "the refractive index (25° C.) of oil from commercial flaxseed has varied from 1.47550 to 1.47975 during recent seasons. With this wide variation some question arises as to the value of the method for the estimation of the oil in the seed, as the method assumes that the refractive index is fairly constant."

The chemical analysis of butter for moisture, salt, curd, and fat, L. C. Thomsen et al. (*Jour. Dairy Sci., 20 (1937), No. 6, pp. 351–357*).—This is a report by the subcommittee on the chemical analysis of butter of the American Dairy Science Association, superseding a previous report of this subcommittee (E. S. R., 65, p. 110).

Development of methods for the estimation of mold in cream or butter, J. D. Wildman (*Jour. Assoc. Off. Agr. Chem., 20 (1937), No. 1, pp. 93–100, figs. 3*).—This article from the U. S. D. A. Food and Drug Administration describes a microscopic method for estimating the amount of vegetable mold in butter and a rapid macroscopic method (methylene blue-borax test) for detecting and estimating the amount of mold in cream.

Report on fat in feeding stuffs, L. S. Walker (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 349–351*).—This contribution from the Vermont Experiment Station compares as to consistency and accuracy of results a short extraction method involving the use of a Goldfisch extractor (3 or 4 hr.) with the Official (16 hr.) extraction. The author makes no recommendation on this subject, but presents a record of what this apparatus will do, stating that "any chemist who desires a quick accurate method for the determination of crude fat (ether extract) in feeding stuffs might consider it."

A simple method for determining the lactic acid in silage [trans. title], O. Flieg (*Biedermanns Zentbl., Abt. B. Tierernähr., 9 (1937), No. 2, pp. 178–183; Eng. abs., p. 183*).—A method based on the conversion of lactic acid in silage extracts into acetic acid by controlled oxidation with chromic and sulfuric acids and determining the acetic acid content by distillation is described.

Report on santonin, H. J. Fisher (*Jour. Assoc. Off. Agr. Chem., 18 (1935), No. 4, pp 526–532*).—This contribution from the Connecticut [New Haven] Experiment Station deals with a method for determining santonin by converting it into a dinitrophenylhydrazone, which was found to be quantitatively insoluble in the dilute alcohol (1:2) used for washing the precipitate. Procedures based upon this principle were found capable of somewhat more accurate results

than the methods now in use when applied to pure santonin, but it was less satisfactory with mixtures, and for these it is recommended that the present tentative method be retained.

Report on less common elements in plants, J. S. McHargue (*Jour Assoc. Off. Agr. Chem., 18 (1935), No. 3, pp. 377, 378*).—Some results obtained in the use of a combustion method for determining iodine in crops and food materials at the Kentucky Experiment Station are stated.

AGRICULTURAL METEOROLOGY

Bibliography of meteorological literature (*Roy. Met. Soc. [London], Bibliog. Met. Lit., 4 (1936), No. 1, pp. [2]+53*).—The preface of this bibliography traces the development from its beginning in 1917 as a feature of the *Quarterly Journal of the Royal Meteorological Society* (E. S. R., 48, p. 614).

"The arrangement used until the end of 1935 was a modification of that adopted for the 'International Catalogue of Scientific Literature', issued by the Royal Society from 1900 to 1916. . . . In September, 1935 the International Meteorological Conference at Warsaw adopted and recommended for international use a new classification forming part of the 'Universal Decimal Classification.' This classification was adopted for use in the libraries of the Royal Meteorological Society and the Meteorological Office from January 1, 1936, and will be used in the bibliography for literature received since that date.

"The rapid increase in the volume of meteorological literature has made it necessary to limit the bibliography to the more important works and also to contract still further the titles of periodicals."

Monthly Weather Review [March-April 1937], (*U. S. Mo. Weather Rev., 65 (1937), Nos. 3, pp. 97–133, pls. 11, figs. 15; 4, pp. 135–174, pls. 9, figs. 7*).—In addition to the usual detailed summaries of climatological data, solar and aerological observations, observations on weather on the Atlantic and Pacific Oceans and on rivers and floods, and bibliographical and other information, these numbers contain the following contributions:

No. 3.—Total Solar and Sky Radiation on Mount Washington, N. H., by B. Haurwitz (pp. 97–99); Glaze Storm of March 17–19, 1936, in Pennsylvania and New York, by A. A. Downs (pp. 100, 101); Absorption of Radiation by Water Vapor as Determined by Hettner and by Weber and Randall, by H. Wexler (pp. 102–104); and Aircraft Icing Zones on the Oakland-Cheyenne Airway, by J. A. Riley (pp. 104–108).

No. 4.—On the Relation Between Rainfall and Stream Flow, III, by R. T. Zoch (pp. 135–147) (see p. 747); Preliminary Report on a Study of Atmospheric Chlorides, by W. C. Jacobs (pp. 147–151) (see p. 747); and Duststorms of January–April 1937 in the United States, by R. J. Martin (pp. 151, 152).

Climatic cycles, D. Brunt (*Geogr. Jour., 89 (1937), No. 3, pp. 214–238, figs. 9*).—From a study of various long-time records of temperature and rainfall at a number of places in different parts of the world, considered in connection with sunspot cycles, tree rings, lake levels, clay varves, and other sources of information, the author states that "none of the cycles found occur with such great amplitudes that we can assert that they might not be due to a chance distribution of the observations, and not to truly periodic variations. It is shown that even if some of the cycles found are real physical cycles, they can only account for a small part of the variability of the meteorological phenomena; so small a part indeed that it is of little importance whether the so-called cycles are real or not."

Recent changes of climate and vegetation in southern New England and adjacent New York, H. M. Raup (*Jour. Arnold Arboretum, 18 (1937), No. 2, pp. 79–117*).—The author presents climatic and other evidence tending to show "changes in general living conditions in New England and adjacent New York during the past 3,000 yr., with effects lasting into more recent time." From such evidence the author infers that "a warmer and drier climate has occurred in New England within the past 3,000 yr. The trend since the peak of the warm dry era has been in general toward the cooler and more moist, but probably with minor variations in the opposite direction. There is evidence, further, that the warm dry climate was so recent that the effects of it are still with us in the form of disrupted ranges for southern animals, plants, and forest types. Judging by various estimates related to the rate of subsidence and of peat deposition at the shore, it is thought that the warm water fauna was still abundant on our coast about 1,000 yr. ago, a figure which places the warm period in general coincidence with similar eras in the Middle Western States, in northern Europe, and in Greenland."

On the relation between rainfall and stream flow, III, R. T. Zoch (*U. S. Mo. Weather Rev., 65 (1937), No. 4, pp. 135–147, figs. 3*).—Continuing earlier work (E. S. R., 73, p. 12; 75, p. 590), this is primarily a mathematical study of rainfall and stream-flow relationships, with special reference to rate of rainfall, condition of soil, velocity of the water, and evaporation.

Western Interstate Snow-Survey Conference (*Amer. Geophys. Union Trans., 17 (1936), pt. 2, pp. 529–562, figs. 12*).—Reports and papers presented at the conference at Pasadena, Calif., January 31, 1936, are given as follows: Status of Coordination and Standardization of Snow-Surveying, by J. C. Marr (pp. 530–533); Precipitation-Surveys for Anticipating Water-Supplies, by H. K. Burton and J. C. Alter (pp. 533, 534); The Effect of Soil-Absorption on Snow-Survey Forecasting of Stream-Flow, by H. P. Boardman (pp. 534–537); Calculation of Normals for Use with Snow-Survey Data, by C. H. Lee (pp. 537–539); Lamoille Creek Basin Normals—a Case in Which Extension of Normals by Comparison With Precipitation-Data Proved More Valuable Than by Comparison With Another Stream, by C. Elges (pp. 539–542); Extension of Normals by Precipitation-Data and by Comparison With Another Stream, by G. L. Parker (pp. 542, 543); Soil-Absorption and Its Effect on Stream-Flow Forecasts in Utah, by G. D. Clyde (pp. 543–545); The Adirondack Snow-Survey, by E. S. Cullings (pp. 545–548); Instructions to Observers (pp. 548–550); Improvement in Snow-Survey Apparatus, by J. E. Church (pp. 550–557); Questionnaire and Answers on Snow-Survey Equipment and Methods, by J. E. Jones (pp. 557–562); and Historical and Administrative, by J. E. Church (p. 562).

Microclimatic character of the warm air layer on the soil, I–III [trans. title], **R. Geiger** (*Met. Ztschr. [Braunschweig], 53 (1936), No. 10, pp. 357–360, figs. 2; 54 (1937), Nos. 4, pp. 133–138, figs. 3; 8, pp. 278–284, figs. 5*).—In a study of the heat relations of the air layers within 2 m of the soil, using a special form of electric thermometer under different diurnal and weather conditions, especially those prevailing on warm, sunshiny days and at different times of the day, it was found that temperatures were from 6° to 36° C. higher at midday near the surface of grass-covered soil than in an ordinary thermometer shelter. At night it was from 2° to 6° colder. The marked influence of wind on temperature variations was confirmed.

Preliminary report on a study of atmospheric chlorides, W. C. Jacobs (*U. S. Mo. Weather Rev., 65 (1937), No. 4, pp. 147–151, figs. 4*).—Observations and analyses are reported which indicate "that there is considerable chloride

present in the air and that the supply is continually being replenished from the sea. It is indicated, further, that a large proportion of the particles must be of such small size that they are capable of remaining suspended in the air. Except for an excess of chloride, which might occur with the presence of extremely large droplets or sea spray resulting from high onshore winds, it is believed that the droplets of sea water are true colloidons and, as such, even without evaporation, may be considered as semipermanent in the atmosphere. That is, they may remain suspended permanently unless removed through condensation and precipitation."

Climatological data for the United States by sections, [1936] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 23 (1936), No. 13, pp. [261], pls. 5, figs. 27*).—Summaries are given of climatological data for each month of 1936 and for the year as a whole for each State.

Meteorological summary for 1935 at Fairbanks, Alaska, R. L. Frost (*Alaska Sta. Bul. 5 [1936], pp. 3–6*).—It is stated that the winter of 1934–35 at Fairbanks was unusually mild, the lowest temperature being only —42° F. Snowfall during the first few months of winter was very light, but the total for the year was 116.2 in., more than twice the normal. The summer months were generally cool and cloudy. The highest temperature recorded in 1935 was 84° on July 8, and the lowest was —59° on December 7. The average temperature for the year was 23.8°, 2.2° below normal. The total precipitation for the year was 17.48 in., 5.99 in. above normal. There were 83 clear days, 92 partly cloudy, and 190 cloudy days. One hundred percent sunshine was recorded on 58 days, and the days entirely without sunshine totaled 81. The last killing frost in spring for tender plants was May 24, the last for hardy plants May 14. The first killing frost in fall for tender plants was August 22, for hardy plants September 9.

[Meteorological summary for 1936] (*Alaska Sta. Bul. 6 [1937], pp. 3–5, 6, 39*).—The summer season of 1936 in the Tanana Valley up to August 18 was very dry. The average temperature from May to August was 4.5° F. above normal. The high temperature and dry weather hastened maturity of grain and delayed growth of potatoes. The "growing season for tender plants extended from May 12 to September 8, a total of 119 days. For hardy plants, the growing season lasted from May 10 to September 8."

Meteorological tables, H. M. Wills and A. E. White (*Mich. State Bd. Agr., Ann. Rpt. Sec., 75 (1936), pp. 219–232*).—Data corresponding to those previously noted (E. S. R., 75, p. 590) are reported for the year ended June 30, 1936.

SOILS—FERTILIZERS

[Soil and fertilizer investigations by the Idaho Station] (*Idaho Sta. Bul. 221 (1937), pp. 8, 9, 46, 47*).—Work is reported on the availability of phosphorus in Idaho soils and fertilizer experiments with "slick" soils, both by H. P. Magnuson, and negative results with raw rock phosphate, by J. Toevs.

[Soil and fertilizer work of the Kentucky Station] (*Kentucky Sta. Rpt. 1936, pt. 1, pp. 22, 23, 40–43, 55.*).—The station reports work on the iodine content of plant materials, soils, and fertilizers; effect of limestone on availability of rock phosphate; comparison of phosphates under field and greenhouse conditions; effect of manure in a cropping rotation; a new method for determining soil moisture; and soil management studies.

[Soil research by the Massachusetts Station] (*Massachusetts Sta. Bul. 339 (1937), pp. 10, 11, 12, 13, 14, 32, 35, 46*).—Brief reports are included on magnesium requirements of plants, by W. S. Eisenmenger and K. J. Kucinski; the comparative nutritive effects of copper and zinc, by H. R. DeRose, Eisen-

menger, and W. S. Ritchie; distribution of nitrogen in soils mixed with different plant tissues and allowed to react for 2 mo., by Eisenmenger; experimentation with artificial manure, including analyses, by Kucinski and Eisenmenger; the water-supplying power of soils, by L. H. Jones; and a survey as to the extent of soil erosion in Massachusetts, by D. Rozman.

[Soil and fertilizer research by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1936], pp. 26–28, 30, 31*).—The work here reported includes experimental studies of optimum soil nitrate levels, effect of day length and acidity on the assimilation of nitrate and ammonia nitrogen, the effect of crops on soil acidity, the effect of magnesic liming materials on the calcium in forage plants, basicity of fertilizer ingredients, and availability of the phosphates in calcined phosphates and calcium metaphosphate.

[Soil Survey Reports, 1930 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Rpts.], Ser. 1930, Nos. 43, pp. 80, figs. 4, maps 2; 44, pp. 36, figs. 2, map 1; 45, pp. 39, pl. 1, figs. 2, map 1; 46, pp. 29, pls. 2, figs. 3, map 1*).—The four surveys noted were prepared in cooperation with other agencies, No. 43 the Vermont Experiment Station and Commission on Country Life, Nos. 44 and 45 the Indiana Station, and No. 46 the Michigan Station and Department of Conservation.

No. 43. *Soil survey (reconnaissance) of Vermont*, W. J. Latimer et al.—Vermont possesses a land area of 5,839,360 acres, of which the outstanding physiographic features are the Green Mountains and other ranges and isolated peaks, a rather high plateau, and the broad, low Champlain Valley of the northwestern part of the State.

The present reconnaissance report lists 41 series inclusive of 58 types and numerous slightly variant phases of these types. The total area is so evenly distributed among the many types that no one type covers a noteworthy percentage of the total area of the State, Berkshire stony loam leading with 6.9 percent. Rough stony land covers 22.1 percent and is devoted mainly to forestry.

No. 44. *Soil survey of Rush County, Indiana*, C. S. Simmons et al.—Rush County covers 261,760 acres somewhat southeast of the center of Indiana. Drainage is to the Ohio River, mostly by way of the East Fork White River, the White River, and the Wabash River.

The report lists 19 series divided into 22 types. Brookston silty clay loam, a highly productive soil, is the most extensive, occupying 28.5 percent of the area surveyed. Russell silt loam covers 17.7, Miami silt loam 13.3, and Crosby silt loam 12.4 percent.

No. 45. *Soil survey of Dubois County, Indiana*, C. S. Simmons et al.—Dubois County contains 273,280 acres of generally well-drained, for the most part, gently rolling lands in the southwestern part of Indiana.

The report lists 23 series, 27 types. Zanesville silt loam covers 50.8 percent of the area examined and Holly silt loam 15.4 percent. The section on management was written by A. T. Wiancko and S. D. Conner.

No. 46. *Soil survey of Iron County, Michigan*, Z. C. Foster et al.—Iron County possesses a land area of 751,360 acres in the western part of the Upper Peninsula of the State and is, in general, "moderately hilly."

The soils of this county are listed as 26 series, inclusive of 31 types. The more extensive of these soils are Iron River silt loam and loam, 17 and 12.8 percent, respectively, Hiawatha fine sandy loam 10.1 percent, and carbondale muck 8.3 percent of the county.

[Soil Survey Reports, 1932 Series] (*U. S. Dept. Agr., Bur. Chem. and Soils [Soil Survey Repts.], Ser. 1932, Nos. 17, pp. 40, figs. 2, map 1; 18, pp. 36, pls. 2,*

figs. 2, map 1; 19, pp. 38, figs. 2, map 1).—The three surveys noted in these reports were carried out with the cooperation of the North Carolina Department of Agriculture and Experiment Station, the South Carolina Station, and the Oklahoma Station, respectively.

No. 17. *Soil survey of Brunswick County, North Carolina*, S. O. Perkins and E. F. Goldston.—Brunswick County, southeastern North Carolina, is an area of 546,560 acres of Atlantic Coastal Plain "flatwoods", of which "only slightly more than 6 percent of the total area is cleared and under cultivation", mainly because of "inadequate drainage and large areas of poor soils." The county is, in general, flat to undulating, and "probably not more than 30 percent of the land is naturally well drained."

There were found in Brunswick County 19 series of soils, including 29 types, but the most extensive of these classified types, Leon fine sand, covers only 9.1 percent of the county. Unclassified lands take up nearly one-fourth of the total area. Of the total area 24.4 percent consists of swamp, coastal beach, meadow, peat, peaty muck, and tidal marsh.

No. 18. *Soil survey of Abbeville County, South Carolina*, F. R. Lesh et al.—Abbeville County, northwestern South Carolina, is an area of 326,400 acres which "ranges from undulating and rolling to strongly rolling, steep, and broken." The county includes also a rather large flatwoods section. Drainage ranges from fair, with poor subsoil drainage, to excessive and erosive.

Of the 11 series and 16 types found in Abbeville County, Cecil clay loam is the most extensive, covering 33.4 percent of the county, and its nonagricultural broken and stony phases take up 11.8 percent additional. Cecil sandy loam, of which 12.2 percent out of a total of 15.3 percent is a mixed phase, is second in areal extent. Under the head of "miscellaneous land types" are listed a total of 27.2 percent either entirely nonagricultural or very poor.

No. 19. *Soil survey of Mayes County, Oklahoma*, M. H. Layton and O. H. Brensing.—Mayes County, northeastern Oklahoma, occupies 432,640 acres of lands lying partly in the Ozark region and partly in the prairies. Drainage is provided by the Neosho River and numerous tributaries.

The soils of this county form 16 series of 23 types. Bates very fine sandy loam constitutes 15.5 percent of the soil area examined, Parsons silt loam following with 14.9 percent and Okoee stony loam with 13.9 percent. Rough stony land totals 4.4 percent.

Soil survey of Indiana County, Pennsylvania, R. T. A. Burke et al. (*U. S. Dept. Agr., Bur. Chem. and Soils* [*Soil Survey Rpt.*], *Ser. 1931, No. 27, pp. 52, figs. 2, map 1*).—Indiana County occupies an area of 530,560 acres in west-central Pennsylvania. The lands of this county consist in general of "rather smooth rolling and hilly country." Drainage, provided by the Allegheny and Susquehanna River systems, is "matured and dendritic" and is quite generally very good.

The soils mapped in the county are included in 17 series, consisting of 34 soil types and 12 phases. The more important types are Ernest silt loam and Gilpin gravelly silt loam, each 11.4 percent of the total area surveyed.

This survey was carried out with the cooperation of the Pennsylvania Experiment Station.

Soil properties determining the botanical composition of pastures in West Virginia, R. R. Robinson (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 12, pp. 877–897, figs. 5*).—In a cooperative investigation carried out by the U. S. D. A. Bureau of Plant Industry and the West Virginia Experiment Station, soils belonging mostly to the Hagerstown and Dekalb series were analyzed for pH, available phosphate, total nitrogen, total exchange capacity, total exchange-

able bases, exchangeable potassium, and in some cases exchangeable calcium, magnesium, and soda. The percentage base saturation was calculated from the values for total exchangeable bases and total exchange capacity. Soil samples stored air-dry for a period of 1 yr. showed marked increases in available phosphate.

"A straight-line relationship was found to exist between the total nitrogen content and the total exchange capacity of these soils, the coefficient of correlation being 0.804 (*n* is 119, and the probable minimum correlation is 0.74). This high correlation emphasizes the importance of the organic exchange complex and is especially significant since the texture of the soils varied from sandy loams to silty clay loams. In general, the percentage base saturation of the soils studied is closely associated with the pH value, the coefficient of correlation for the entire group being 0.922 (*n* is 117, and the probable minimum correlation is 0.9). In the Dekalb soils, however, it was found that with a high ratio of organic to inorganic exchange complex, the percentage base-saturation values at a given pH value were relatively high, showing that the acids of the organic exchange complex are stronger than those of the inorganic.

"A comparison of the nitrogen content of the 0- to 3- and the 3- to 6-in. layers of Dekalb soils that have been in permanent pasture about 20 to 50 yr. shows that the 0- to 3-in. layer is 85 percent higher in available phosphate and 65 percent higher in total nitrogen than the 3- to 6-in. layer. The data indicate that approximately 1,000 lb. per acre of nitrogen have been accumulated during this period.

"A comparison of samples from the same pastures shows that, in general, soils supporting Kentucky bluegrass are higher in pH, percentage base saturation, total exchangeable bases, available phosphate, total nitrogen, and exchangeable potassium than soils supporting *Danthonia*. A statistical analysis of all samples, however, shows that the primary chemical properties limiting the percentage of Kentucky bluegrass and white clover in the pastures studied are percentage base saturation and available phosphorus. On shaly loam soils moisture appears to be limiting to the extent that Kentucky bluegrass and white clover may not be able to maintain a stand, although the chemical properties of the soil indicate that conditions are favorable for these species. Moreover, the soils supporting bentgrass are in a higher state of fertility than those supporting *Danthonia*, and consequently when Kentucky bluegrass is competing with bentgrass rather than with *Danthonia*, the available plant food must be greater in order to support a good stand of Kentucky bluegrass. . . .

"In the Hagerstown soils there is a high correlation between the percentage of Kentucky bluegrass plus white clover in the pasture and the amount of available phosphate in the soil. The index of correlation for this relationship is 0.901 (*n* is 17, and the probable minimum correlation is 0.79). The studies on the Dekalb soils show that percentage base saturation is a much better measure of the effect of soil acidity on the plant than is pH value, the index of correlation with the percentage of Kentucky bluegrass plus white clover being 0.800 for pH and 0.945 for percentage base saturation. The probable minimum correlations are 0.60 for pH and 0.88 for percentage base saturation. The data indicate that the relationship between the chemical properties of the soil and the amounts of Kentucky bluegrass and white clover is closer within a soil series than among different series.

"In general, 60-percent base saturation, corresponding to about pH 5.5 for the soils studied, 0.145 percent of total nitrogen, and 0.2 milligram equivalents

of exchangeable potassium per 100 g of soil appear adequate for maximum percentages of Kentucky bluegrass and white clover on these soils, if other factors are not limiting. On the basis of values obtained shortly after the samples were collected, 18 p. p. m. of available phosphate appear adequate for a good stand of Kentucky bluegrass and white clover, if other conditions are not limiting. On the basis of determinations made 1 yr. later, 24 p. p. m. are necessary. It should be recognized, of course, that the minimum values for percentage base saturation, total nitrogen, and available phosphate necessary for the maintenance of a high percentage of Kentucky bluegrass and white clover in permanent pastures are lower than the values necessary for the production of maximum yields."

Soil organic matter investigations upon Coastal Plain soils, J. B. HESTER and F. A. SHELTON (*Virginia Truck Sta. Bul. 94 (1937), pp. 1395–1428, figs. 9*).—The authors analyzed certain of the truck gardening soils in the eastern part of the State to determine the content of organic matter (carbon × 1.724) and the nitrogen content of the surface soil and subsoil.

"The importance of humus in the soil to the availability of phosphates added to the soil has been determined in field and greenhouse experiments. Further, the growth of green manure crops upon soils that have been highly fertilized in the past absorbs and makes available to vegetable crops some of the unavailable phosphates.

"During 3 yr. of a rotation of potatoes followed by sorghum or soybeans, more than 20,000 lb. per acre of top growth was realized from the green manure crops. During this period the organic-matter content of this soil was increased 6,000 lb. per acre. Through the use of a system of cover crops the yield of potatoes was increased as much as 92 percent.

"The data given indicate the advantage of using nitrogen with nonleguminous crops. . . . With potatoes, both legume and nonlegume with mineral nitrogen are very satisfactory for increasing crop yield. Many other materials like manure, pine needles, and peat may be used to increase the organic-matter content of the soil, but they do not conserve the plant nutrients as do growing cover crops."

Rotations for soil improvement are suggested.

Soils in relation to fruit growing in New York.—XI, The organic-matter content of New York orchard soils in relation to orchard performance, R. W. CUMMINGS (*[New York] Cornell Sta. Bul. 672 (1937), pp. 26, figs. 3*).—In continuation of the work previously noted in this series (E. S. R., 77, p. 308), the carbon and the nitrogen content were determined on 96 surface soils and 31 subsoils in Wayne, Orleans, Monroe, and Columbia Counties. The nitrogen content was determined also on 65 additional surface soils selected from pits dug for rooting studies in Baldwin apple orchards in Wayne and Orleans Counties.

"The carbon content ranged from 0.75 to 3.95 percent in surface soils and from 0.03 to 1.35 percent in subsoils. Correspondingly, the organic-matter content varied from 1.29 to 6.81 percent in surface soils and from 0.05 to 2.33 percent in subsoils. The nitrogen content ranged from 0.056 to 0.319 percent in surface soils and from 0.007 to 0.072 percent in subsoils. The mean carbon: nitrogen ratio for 96 surface soils was 12.74±0.08 with a range of 10.4 to 17.9, and for 31 subsoils it was 8.25±1.38 with a range of 2 to 38.6. The mean carbon: nitrogen ratio, and also the mean percentages of carbon and nitrogen, for the Columbia County soils were slightly lower than those for the lake shore counties. This may or may not be significant.

"In Wayne and Orleans Counties the organic-matter content of surface soils shows no significant correlation with the available yield data, even within soil types or within groups of similar soils. Although fewer comparisons are possible, trunk circumference shows no consistent relation to organic-matter content of the soil in the orchards studied in Columbia County."

It is concluded that the determination of total organic carbon, nitrogen, or organic-matter content of a surface soil in itself has little or no prediction value as to the behavior of apple trees planted on that soil.

Forest lysimeter studies under red pine, H. A. Lunt (*Connecticut [New Haven] Sta. Bul. 394 (1937), pp. 217–268, figs. 12*).—Six tank-type lysimeters and 12 of the pan type (an improved design) were maintained in a red pine plantation 3 and 2 yrs., respectively, "for the purpose of determining the kind and amount of materials which leach out of (1) the forest floor (herein referred to as litter), (2) the upper 4 in. of mineral soil, and (3) the litter and soil together in their natural position." Nitrates, conductivity, and reaction were determined following each significant rainfall. The other constituents were determined on composite aliquots three times a year.

In the course of the year, natural precipitation in a red pine plantation caused the removal from the litter of from 7 to 31 lb. of nitrogen per acre, 29 to 53 of calcium, 14 to 31 of potassium, 18 to 35 lb. of sulfur, lesser amounts of magnesium, and small amounts of iron, phosphorus, and silica. "The larger amount in each instance refers to the maximum obtained in the tank lysimeters where root competition was eliminated. The smaller figure represents the minimum amount from the pan lysimeters with normal root competition." The mean annual amounts of the four main constituents leached from the pan-litter lysimeters were nitrogen 16 lb., calcium 30, potassium 15, and sulfur 18 lb. From the analysis of freshly fallen pine needles, it is estimated that the amount of material deposited on the soil each year in a plantation of the age of this one approximates from 55 to 60 lb. of nitrogen, 30 of calcium, and 15 lb. of potassium, "to which must be added the amounts brought down by rainfall and that resulting from decomposing roots and animal remains. It is impossible to strike a balance . . . with any degree of accuracy, but the figures given indicate that there is a fairly close balance between deposition and removal.

"In the case of the tank lysimeters the amounts of nitrogen, calcium, and potassium which came from the litter constituted a significant portion of the total amount present in the litter as determined by analysis.

"Leachate from the bare soil yielded during the course of a year from 1.5 to 40 lb. of nitrogen, from 9 to 47 . . . of calcium, 3 to 19 of potassium, 8 to 20 lb. of sulfur, and small amounts of other materials. While these amounts were, on the whole, less than that which came from the litter, the concentration in milligrams per liter was as great or greater than that from the litter. Excepting nitrogen obtained during the first year in the tank lysimeters, the amount of constituents obtained from the soil-and-litter lysimeters was, in general, no greater than that from the litter alone, and the concentration was not greatly different. Such data indicate that the soil absorbed or fixed much of the material coming from the litter; otherwise the amounts from the soil and litter would equal the sum of that from the litter and the bare soil. The greatest amount of nitrogen was obtained in the second period, i. e., between July 15 and November 20 . . . This was not true of calcium, potassium, or any other constituent for which analysis was made."

It is concluded in part that, under natural forest conditions, especially those of an evergreen forest (the presence of roots which constantly draw upon the moisture and plant nutrients liberated by the decomposing litter), losses by percolation are practically nil. "A forest soil may be likened to an agricultural soil which is kept in crop continuously—pasture or alfalfa, for example—but with the added advantage of lessened evaporation because of the shade and retarded wind movement."

Variation in the nitrogen content of irrigation water carrying dissolved nitrogen fertilizer, R. J. BORDEN and K. H. BERG (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *41* (*1937*), *No. 2, pp. 91–97, figs. 4*).—Experiments showing considerable variations in the nitrogen content of water carrying dissolved sodium nitrate to sugarcane are reported. Practical suggestions are made for better control and approved technic to avoid uneven distribution of fertilizer material and spotty cane growth.

Effect of superphosphates in conserving nitrogen in cow manure A. R. MIDGLEY and V. L. WEISER (*Vermont Sta. Bul. 419* (*1937*), *pp. 23, fig. 1*).—Superphosphate of high calcium sulfate content was found more effective in conserving ammoniacal nitrogen than that containing relatively little of the sulfate.

"Gypsum (calcium sulfate), when used alone, is of little service in conserving ammoniacal nitrogen, but works well when added to a phosphate. Its calcium is then partially removed in the precipitation of tricalcium phosphate, leaving an equivalent amount of sulfuric acid to form a stable compound—ammonium sulfate. While phosphorus solubility is greatly reduced by the formation of tricalcium phosphate, which is precipitated in a very finely divided form and in the presence of decaying organic matter, its availability is not materially reduced. On the other hand, it is quite possible that it may become even more available to plant uses in this condition since it is less easily fixed into nonavailable forms by the soil."

It is further pointed out that the use of superphosphate to conserve the ammoniacal nitrogen of manures has a special value in Vermont in that most of the soils of the State need additional supplies of available phosphate. Usage in the stable is advocated both for this reason and for its value as an absorbent and antiseptic.

Overliming injury in relation to tannin-containing materials, A. R. MIDGLEY and D. E. DUNKLEE (*Vermont Sta. Bul. 420* (*1937*), *pp. 28, figs. 2*).—This bulletin reports a further investigation into the probable nature and cause of the overliming injury already studied by the station (E. S. R., 68, p. 598).

Overliming injury in relation to tannin-containing materials, A. R. definitely toxic effect which injures, and frequently kills, seedlings before they have had time to exhaust even the food reserves of the seed. It is not relieved by supplying available nutrients.

Overliming injury could only be produced by heavy applications of lime to very acid soils. Like treatment of neutral or basic soils did not engender the toxicity in question. Podzolized soils, "especially the severely leached A horizons", produced an especially severe toxicity. Also, "normal soils relatively high in organic matter may be made to produce similar injury if, before liming, they are treated with acid to remove their bases, in a way comparable to the processes of podzolization. . . . The toxin is hard to destroy, but it is possible to get rid of it by completely removing the organic matter. . . .

"Many plant tissues and tree barks, made acid in a manner equivalent to the process of podzolization, caused typical overliming injury when used as media on which to grow flax seedlings. Only tannin-bearing materials produced this trouble, the barks of hemlock, spruce, pine, and other plants normally growing on podzolized soils being especially harmful." The tannin content of the plant materials active in producing overliming injury was shown to be usually a catechol tannin rather than a pyrogallol tannin. "The chemical structure of the natural bodies causing overliming injury is not known. They seem to be phenolic resinous substances related to tannins." It is noted that synthetically prepared phenolic resins have been "produced and made to cause typical overliming injury."

Minor elements and crop fertilization, R. C. Collison (*New York State Sta. Circ. 168 (1937), pp. 18*).—Following a brief historical outline, the author limits the discussion mainly to boron, manganese, copper, and zinc and to physical and chemical characteristics of soils likely to be associated with deficiencies in one or more of these four elements.

"In attempting . . . to predict, if possible, the particular soils in which these minor elements would most likely be deficient, one would naturally look for soils with the following characteristics: (1) Soils high in silica and low in silicate minerals, in other words, the sandy soils of water-laid origin, low in organic matter; (2) soils originally low in lime or those from which most of the lime has been leached, in other words, soils with an acid profile throughout; (3) soils showing little or no compaction throughout the profile, in other words, well-drained soils in which unobstructed leaching has taken place over long periods of time. These characteristics would be accentuated in regions of high rainfall."

The author points out that stimulation of plant growth may be produced by small additions of the minor elements even where actual deficiencies, as indicated in the plants by physiological disturbances, do not exist.

Selenium in plants in relation to its occurrence in soils, J. T. Miller and H. G. Byers (*Jour. Agr. Res. [U. S.], 55 (1937), No. 1, pp. 59–68, figs. 5*).—In a contribution from the U. S. D. A. Bureau of Chemistry and Soils, the authors report the observation that the plants found in the wide areas where seleniferous and normal soils occur in juxtaposition fall into three general classifications with respect to their relation to selenium in the soil, as follows:

There was (1) a group of species rarely found outside of the seleniferous areas and capable of absorbing selenium readily and in relatively large quantities. "Since analyses show these plants to be consistently high in selenium and to be growing vigorously even with a very high content, it seems possible that selenium may be of importance to their physiological processes." This possibility is rendered the more probable by the observation that, "in almost every location where these highly selenized plants have been found on seleniferous soil, they have been wholly absent or very rare on adjacent nonseleniferous areas." Among these are *Astragalus racemosus*, *A. pectinatus*, *A. bisulcatus*, *A. carolinianus*, *Stanleya pinnata*, *S. bipinnata*, *Applopappus fremonti*, and *Xylorrhiza parryi*.

There were also found "(2) plants that are able to absorb moderate, or even large, quantities of selenium without severe injury. Such plants are found widely distributed on both seleniferous and nonseleniferous areas. Among such plants are white wreath aster, blue aster, turpentineweed, sunflower, western wheatgrass (*Agropyron smithii*), and perhaps others. Included in this group are the common cereals wheat, rye, barley, and corn. To what extent the growth of such plants is retarded by the presence of small quantities of

selenium is not known, but it is certain that there is a rather low tolerance limit for the soil.

(3) Plants that have a very limited tolerance of selenium and are able to absorb only small quantities when grown on seleniferous soils: In places where the concentration of selenium in the surface soils is high these plants either do not appear or they are of limited occurrence and make poor growth. The most notable examples of this group are buffalo grass and the grama grasses *Bouteloua gracilis* and *B. curtipendula*."

Within the pH range of the soils examined (7.5 to 8.4), the soil reaction appeared to have little influence upon selenium absorption.

Commercial fertilizers, H. R. Kraybill et al. (*Indiana Sta. Circ. 229 (1937), pp. 75, figs. 2*).—In addition to the usual report on the analysis of 1,493 inspection samples, this circular tabulates the average composition of the common fertilizer materials; tonnages of the analyses sold in largest quantities; tonnage, retail value, and pounds per ton of plant food; tonnage sales of low and of high analysis fertilizers for the past 22 yr.; etc.

AGRICULTURAL BOTANY

Range plant handbook (*U. S. Dept. Agr., Forest Serv., 1937, pp. [839], figs. [296]*).—"Repeated requests from field officers of the Forest Service for an accurate publication, readily consultable under field conditions, in as simple language as possible, which could be assembled as desired, and be easily revised, were the genesis of this loose-leaf range plant handbook. Its intended audience is primarily busy field administrative men who are not specialists in botany; its chief purpose is twofold: (1) To evaluate for such persons, in as succinct, understandable, complete, and useful form as possible, the relative importance of some 300 or more of the outstanding 'key' plants of western ranges as regards grazing, watershed protective cover, recreational, and other uses; and (2) to enable the ready field identification of these plants in order to insure the correlation of the proper management data with each species. . . . This handbook presents 339 generic and specific write-ups, incorporated with which, however, are notes on over 500 additional species. The main treatments include 98 grasses, 8 grasslike plants (chiefly sedges and rushes), 137 range weeds (nongrasslike herbs), and 96 browse plants. Because of the loose-leaf structure of this handbook, the text and illustrations are not paged. Each plant discussion has its own symbol (G1, G2, etc., for grasses; GL1, GL2, etc., for grasslike plants; W1, W2, etc., for range weeds; and B1, B2, etc., for browse). Gaps which appear in the symbol sequences are by way of provision for the possible future inclusion of some 173 other plants of material range importance."

An index to common and scientific names is provided.

Aquatic vegetation of the Susquehanna and Delaware areas, W. C. Muenscher (*N. Y. State Conserv. Dept. Ann. Rpt., 25 (1935), Sup., pp. 205–221*).—This study by Cornell University was confined mainly to the larger lakes, reservoirs, and a few ponds of special interest. Lists are included of the common aquatic plants in some lakes of the eastern and western parts of the Susquehanna and of the Delaware watersheds, and an annotated list supplies an inventory of the 136 kinds of plants found, together with notes on their general distribution and abundance in the watersheds, the last named list being arranged by plant families.

Keys to woody plants, W. C. Muenscher (*Ithaca, N. Y.: [Author], 1936, 4. ed., rev., pp. 105, [figs. 3]*).—This contribution by Cornell University is a revision of the work already noted (E. S. R., 49, p. 426).

Prospects for a natural system of classification of bacteria, A. J. KLUYVER and C. B. VAN NIEL (*Zentbl. Bakt. [etc.], 2. Abt., 94 (1936), No. 19–23, pp. 369–403, fig. 1*).—The authors discuss the motives for a renewed discussion of the subject and the general principles of bacterial classification, give a critical examination of recent contributions to the subject, and present an outline for "a rational system for bacterial classification on the basis of our present knowledge." Tabular presentations are also included, and lists of tribes and genera, with diagnoses of the latter, are appended.

Some observations on the natural bacterial system proposed by A. J. Kluyver and C. B. van Niel [trans. title], S. ORLA-JENSEN (*Zentbl. Bakt. [etc.], 2. Abt., 95 (1937), No. 21–26, pp. 478–482*).—The author offers comments on the system of bacterial classification proposed by Kluyver and van Niel and noted above.

The nutritional requirements of bacteria, W. BURROWS (*Quart. Rev. Biol., 11 (1936), No. 4, pp. 406–424*).—This is a general review (with bibliography) centered principally around the indispensable elements, growth accessory substances, essential substances, and growth-stimulating substances as affecting bacterial metabolism.

Some heavy metals necessary for the culture of Aspergilli and the procedure for freeing nutrient solutions from traces of them [trans. title], T. SAKAMURA (*Jour. Faculty Sci., Hokkaido Imp. Univ., Ser. V, 4 (1936), No. 3, pp. 99–116, figs. 2*).—*Aspergillus niger, A. oryzae,* and *A. tamarii* were used in the physiological studies reported.

The action of copper and manganese upon the formation and color of conidium of some species of Aspergillus, F. YOSHIMURA (*Jour. Faculty Sci., Hokkaido Imp. Univ., Ser. V, 4 (1936), No. 3, pp. 117–139, pls. 6, figs. 37*).—The proper combination of copper (or zinc) and manganese gave rise to the formation of normal conidium-bearing heads, while omission of either of the two caused a reduction in sporulation and an abnormal development of the conidial heads. Transitions from conidial to spherical cell formation were induced when the amount of manganese was varied, rendering it probable that an intimate relation exists between these two tendencies. Manganese also extended the pH limits for growth on the acid side. Copper was found important for sporulation and for the development of pigment in the conidia. Diminution of the amount of sugar also favored sporulation.

Absorption of manganese by plants.—II, Toxicity of manganese to various plant species, C. OLSEN (*Compt. Rend. Lab. Carlsberg, Sér. Chim., 21 (1936), No. 9, pp. 129–145, figs. 7*).—Grown in water cultures, different plants reacted very differently to increasing concentrations of manganous sulfate, the species used being *Lemna polyrrhiza, Senecio silvaticus, Hordeum distichum, Sinapis alba, Zea mays,* and *Deschampsia flexuosa.* The indications are that the amount of dissolved manganese compounds in a strongly acid soil plays an essential role as a growth-inhibitory factor. The fact that only a small number of species can thrive on strongly acid soils is due not only to the high H-ion concentration per se but also to the fact that manganese is so poisonous to most species that they cannot tolerate the amounts absorbed from such soils. Possibly the calcium-ion concentration of culture solutions modifies the toxic effect of manganese, as it has been demonstrated that its ions are antagonistic to manganous ions.

[The relation of boron and iodine to plant growth] (*Kentucky Sta. Rpt. 1936, pt. 1, pp. 21, 22, 23, 24*).—Brief reports are included of studies on the relation of boron to plant growth and on the effect of iodine on the growth of tomatoes, buckwheat, and tobacco.

The reaction of greenhouse plants to gas in the atmosphere and soil, P. R. KRONE (*Michigan Sta. Spec. Bul. 285 (1937), pp. 35, figs. 32*).—Injury resulted from natural gas from Texas and Michigan in the greenhouse air, although higher concentrations were required than for manufactured gas. Tomato, mimosa, geranium, ageratum, coleus, and beleperone plants and cut stems of bougainvillea, Clarkia, and stocks exhibited decided injury from natural gas at 1:200, while Clarkia and bougainvillea were injured at 1:400 for 72 hr. Other plants gave little or no evidence of injury at the latter exposure. In artificial gas at 1:30,000 for 24 hr., injury became apparent on tomato, achyranthes, coleus, mimosa, and geranium, and at longer exposures all of the plants tested were injured. Ethylene is generally conceded to be the most important constituent of gas introduced into the air, as far as plant injuries are concerned.

Some of the foliage symptoms included epinasty, yellowing, premature abscission or defoliation, leaf curling, retarded growth, stimulation of latent buds, and growth of short, weak side branches. When the gas is in the soil the symptoms include swelling of the region back of the root tip and of the hypocotyl, root curling, cracking and sloughing off of the epidermis, and discoloration, hypertrophy, and collapse or death of part or all of the stems or roots.

It is recommended that where gas lines run near a greenhouse a trench be dug along that side of the house, that it be kept open or filled with porous material for aeration during winter, and that young tomato plants be kept in every house as indicators of the presence of escaped gas.

New facts in support of the hormonal theory of plant development, M. C. ČAJLACHJAN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 4 (1936), No. 2, pp. 79–83, figs. 3*)—As a result of experiments with *Perilla nankinensis* and *Helianthus* spp. the author concludes that, together with nutrient substances, there is a movement of "blossom hormone" from the leaves of the stock into the growing points of the engrafted top, where the formation of flowers is induced. This hormone is not considered specific in action for individual species but to be the same in nature in different plants. To this blossom hormone he gives the name "florigen."

Plant hormones and mineral nutrition, G. S. AVERY, JR., P. R. BURKHOLDER, and H B. CREIGHTON (*Nat. Acad. Sci. Proc., 22 (1936), No. 12, pp. 673–678, figs. 2*).—The amount of growth hormone present in shoot tips of *Helianthus* and *Nicotiana* was determined by *Avena* coleoptile curvature for seedling plants grown in sand culture under varying conditions of mineral nutrition. It was scarcely detectable in the shoot tips of plants unsupplied with N. It was most abundant with higher concentrations of N and was unaffected by relatively low supplies of Ca, Mg, K, PO_4, and SO_4 or by variations in osmotic pressure of the nutrient solutions. It was much less in the shoot tips of "frenched" than in normal tobacco.

Production and distribution of growth hormone in shoots of Aesculus and Malus and its probable role in stimulating cambial activity, G. S. AVERY, JR., P. R. BURKHOLDER, and H. B. CREIGHTON (*Amer. Jour. Bot., 24 (1937), No. 1, pp. 51–58, figs. 7*).—Using the agar diffusion method and *Avena* coleoptile curvature as a measure of growth hormone production, no indication of its presence was found in dormant winter buds of horse chestnut and McIntosh apple. It was detectable in increasing amounts from the time of swelling of terminal buds, reaching the peak just prior to the most rapid expansion of current season growth and declining afterward. In *Aesculus*, hormone concentration was greater in fruiting shoots than in others, due to continued pro-

duction in the growing fruits. Hormone production appears to be centered in the terminal buds with translocation down the stems into older portions. Cambial activity began at the terminal bud, progressing basipetally as the hormone moved into these regions.

The hormonal influence of β-indolylacetic acid on the growth of isolated roots in sterile organ culture [trans. title], M. Geiger-Huber and E. Burlet (*Jahrb. Wiss. Bot., 84 (1936), No. 1-2, pp. 233-253, figs. 5*).—Using a method described, the authors studied the effects of different concentrations of heteroauxin on the growth of maize roots in darkness at 18°-22° C.

The inhibition of roots by growth hormone, R. H. Lane (*Amer. Jour. Bot., 23 (1936), No. 8, pp. 532-535, figs. 2*).—Indole-3-acetic acid inhibited the growth of roots of young *Avena* seedlings without appreciable effect on the coleoptiles, the effect on the roots being about 25 times as great as that of indole-3-propionic acid. The number of roots of oats may be greatly increased by indoleacetic acid.

The cotyledon petioles of the Vicieae as indicators for the correlative inhibitory effect of growth-promoting substance [trans. title], R. Dostál (*Planta, Arch. Wiss. Bot., 26 (1936), No. 2, pp. 210-221, figs. 12*).—*Pisum sativum*, *Vicia* spp., *Lathyrus sativus*, *Lens esculenta*, and *Cicer arietinum* were used successfully in such tests.

The correlation effect of storage organs and growth-promoting substance [trans. title], R. Dostál (*Ber. Deut. Bot. Gesell., 54 (1936), No. 7, pp. 418-429, pl. 1*).—Using tubers of *Scrophularia nodosa*, bulblets of *Circaea intermedia*, and pea seedlings in his study, the author concludes, on the basis of the fact that the growth-regulatory effects of the reserves can be supplanted by limited amounts of growth-promoting substance, that such effects must be attributed not to the nutrient materials but to the hormone, which in its action (first in promoting root formation, then shoot formation) corresponds to heteroauxin.

The demonstration of growth-promoting substances for mitosis, using Saccharomyces cerevisiae as the test organism [trans. title], K. Rippel (*Ber. Deut. Bot. Gesell., 54 (1936), No. 7, pp. 487-492*).—The author differentiates the growth-promoting substances of stretching and of cell division, giving special attention to the latter and using yeast as more suitable than the oat coleoptile for studying this phase of the mechanism of mitosis.

The question of the mitotic and cell-stretching hormones of plants [trans. title], K. Rippel (*Planta, Arch. Wiss. Bot., 26 (1937), No. 5, pp. 812-815*).—In this note the author reviews his own work, noted above, and that of others relative to the relationships of growth-promoting substances to mitosis and cell stretching and presents further data, using *Zea mays*, *Urtica dioica*, *Pulmonaria officinalis*, *Pisum sativum*, *Phaseolus multiflorus*, and *Vicia faba*, in addition to yeast, as test plants.

Inactivation of plant growth substance by light, P. R. Burkholder and E. S. Johnston (*Smithsn. Misc. Collec., 95 (1937), No. 20, pp. 14, pls. 2, fig. 1*).—Oat and corn seedlings and terminal shoots of *Nicotiana tabacum* were used in the experiments reported. Sources of light were a mercury quartz arc and a Mazda tungsten lamp. The effects of general and unilateral radiation on the growth substance in coleoptile tips of oats and corn and of light on the growth substance "diffused" into agar in contact with cut surfaces of tobacco shoots and oat coleoptile tips were determined.

"Experimental results reported here indicate marked decreases in growth-promoting properties of irradiated tissue and of agar blocks containing growth substance. When so great losses occur under the influence of controlled radiation as mentioned, it is not probable that translocation of the active material

should play any prominent rôle in growth phenomena at the same time. Under some circumstances, e. g., low light intensity, it may be that more growth substance is moved than is destroyed in the plant. It appears from the experimental evidence presented in this paper that light of high intensities has a destructive or inactivating action on plant growth substance, which is of great importance for phototropism and morphogenesis."

Auxins and the growth of roots, K. V. Thimann (*Amer. Jour. Bot.*, *23* (*1936*), *No. 8, pp. 561–569, figs. 3*).—Differences between *Avena* and *Pisum* roots in their responses to indole-3-acetic acid appear to be based mainly upon differences in their normal auxin content, low concentrations of auxin applied to roots already poor in auxin possibly causing an acceleration of growth. In roots rich in auxin this cannot occur, and in such roots auxin is held not to be a limiting factor in root branching.

The role of auxin in leaf development in Solidago species R. H. Goodwin (*Amer. Jour. Bot.*, *24* (*1937*), *No. 1, pp. 43–51, figs. 10*).—In *S. sempervirens* the seedling rosette has fewer and larger leaves than in *S. rugosa*, and only one leaf is rapidly elongating at a given time. Experiments showed that such a leaf retarded the development of the younger leaves and produced larger amounts of auxin than leaves at any other stage. In *S. rugosa* auxin production was less and probably insufficient to cause periodic retardation. In each species, however, the auxin production per unit of fresh leaf weight appeared greatest in the youngest leaves.

The action of β-indolylacetic acid on the development of seedlings [trans. title], T. Solacolu and D. Constantinesco (*Compt. Rend. Acad. Sci.* [*Paris*], *203* (*1936*), *No. 7, pp. 437–440, figs. 2*).—Studies of the effects of heteroauxin on seedlings and seedling fragments of *Ricinus communis* and *Phaseolus vulgaris* are reported.

The influence of bios on nodule bacteria and legumes.—A, The influence of bios on legume seedlings, D. G. Laird and P. M. West (*Canad. Jour. Res.*, *15* (*1937*), *No. 1, Sect. C, pp. 1–6, figs. 2*).—The concentration of crude bios 2 causing maximum hypocotyl bending in red clover seedlings was observed to be about four times that required to induce optimum stimulation in nodule bacteria. When plants were allowed to start in an unenriched medium superimposed on a layer of agar enriched with crude bios 2, no upward bending of the roots occurred as they reached the bios layer. Bios 2 (b) alone appears to be the factor responsible for the hypocotyl bending. Bios 1, bios 2 (a), pantothenic acids, various amino acids, and miscellaneous compounds tested did not appear active in this respect. Heteroauxin, like bios 2 (b), prevented the hypocotyls from entering an enriched medium. While the two substances induce a certain similarity of physiological effect, they cannot be considered identical, and chemically they are distinct.

A drop of bios 2(b) placed on the sensitive lining of a bean pod induced rapid cell multiplication, and similar though somewhat less distinct results followed the pricking of such tissue with a pin. These results are believed to strengthen the theory that bios possesses the properties of a "wound hormone".

Vitamin B_1, a growth factor for higher plants, J. Bonner (*Science*, *85* (*1937*), *No. 2198, pp. 183, 184*).—Using excised pea root tips in a pure synthetic medium, it was shown that growth ceased completely in the third passage to fresh synthetic medium. Active root growth, however, was maintained if 0.2γ per cubic centimeter of crystalline B_1 was added. Even 0.002γ produced marked stimulation.

The dependence of growth on assimilation, H. CORDES and F. LAIBACH (*Jahrb. Wiss. Bot., 84 (1936), No. 1–2, pp. 223–232*).—Besides its dependence on the concentration of growth-promoting substance, growth in the organs of the plant stem also depends on a second growth factor, the formation of which is bound up with the carbohydrate metabolism, i. e., with the presence of assimilatory products.

The yearly cycle in the physiology of trees, G. W. SCARTH (*Roy. Soc. Canada Trans., 3. ser., 30 (1936), Sect. V, pp. 1–10, figs. 2*).—The author discusses seasonal changes in growth activity, water relations, food reserves, and in the properties of the protoplasm.

Environment, inheritance, and physiological aspect, I, II [trans. title], C. MONTFORT (*Jahrb. Wiss. Bot., 84 (1936), No. 1–2, pp. 1–57, figs. 13; 84 (1937), No. 4, pp. 483–516*).—Two papers are presented.

I. *Death due to light and resistance to strong light in assimilatory tissues.*—These phenomena were studied in their relations to color type, to previous history, and to constitutional adjustment in algae of the three color classes from qualitatively and quantitatively very different light climates exposed to diffuse and to direct sunlight. Comparison of the succeeding light-assimilation curves, as well as the time curves, led to the separation of definite reaction types, which are discussed.

II. *The significance of the natural light field for the specific photochemical action of definite radiations.*—Studies are reported of the range of light absorption by plants in relation to that of its specific photochemical effects (viz, the physiological effects of light from different parts of the spectrum in relation to plastids carrying different pigments), the ranges of specific photochemical activity as determined by the light previously supplied, and observations on the unique position of photosynthesis as compared with light-catalyzed stimulatory reactions in general.

The thermal relations of plants [trans. title], B. HUBER (*Naturw. u. Landw. [Freising], No. 17 (1935), pp. 148, figs. 38*).—This monograph takes up the subject under the factors determining plant temperatures (the temperature of the environment, heat from radiation, cooling through transpiration, and respiratory heat); plant temperatures as actually observed, including various organs (leaves, twigs, buds, and stems), habitats, and climatic conditions; and the biological significance of the thermal economy of plants under maximum and average temperatures.

A bibliography of nearly 12 pages is included.

Investigations of the ecology of photosynthesis in native woody plants of forest and garden [trans. title], H. F. NEUBAUER (*Gartenbauwissenschaft, 10 (1936), No. 3, pp. 380–421, figs. 21*).—This investigation involved the development of methods and studies of the effects of environal factors on photosynthesis in various trees and shrubs (e. g., beech, hornbeam, oak, elm, bird cherry, alder, hazelnut, Japanese quince, currants, etc.)

Effect of light and of ethylene chlorhydrin on the citric acid content of Bryophyllum leaves, J. D. GUTHRIE (*Contrib. Boyce Thompson Inst., 8 (1936), No. 4, pp. 283–288, fig. 1*).—Citric acid normally increased fivefold during the night, but ethylene chlorohydrin treatment caused a decrease in citric acid in the dark and a consequent increase in the pH of the juice.

Investigations of the influence of light factors on the growth and development of some summer annuals [trans. title], L. KOPETZ (*Gartenbauwissenschaft, 10 (1936), No. 3, pp. 354–379, figs. 5*).—The author's experiments relative to the effects of length of day were performed on peas, lettuce, spinach, and soybeans.

The metabolic changes in seedlings exposed to one-sided illumination [trans. title], P. METZNER (*Ber. Deut. Bot. Gesell., 54 (1936), No. 7, pp. 455–471, figs. 2*).—As in geotropic stimulation, it was found that after unilateral lighting of the hypocotyls of *Helianthus* metabolic differences appeared in the stimulated side, including changes in sugar content, acidity, and catalase activity.

The effect of street lights in delaying leaf-fall in certain trees, E. B. MATZKE (*Amer. Jour. Bot., 23 (1936), No. 6, pp. 446–452, figs. 6*).—"Street lights in the City of New York cause a retention of the leaves of certain trees: Carolina poplar (*Populus canadensis*), London plane (*Platanus acerifolia*), sycamore (*P. occidentalis*), and crack willow (*Salix fragilis*). Illuminated portions of a tree retain their leaves; shaded portions of the same tree do not."

The mechanism of the germination-promoting effect of the soil [trans. title], H. BORRISS (*Ber. Deut. Bot. Gesell., 54 (1936), No. 7, pp. 472–486, figs. 5*).—On the basis of tests with seeds of *Vaccaria pyramidata*, it is concluded that the germination-promoting effect of the soil is due not to the presence of any stimulating factor but rather to the removal of an inhibitory substance from the seeds by the adsorptive power of the soil complex. Other contributory factors are also discussed.

On the relation between the ripening stages of the maize-seed and its germination, T. KOSHIMIZU (*Bot. Mag. [Tokyo], 50 (1936), No. 597, pp. 504–513, figs. 8*).—The seeds on an ear not fully mature were found to differ in the degree of ripeness, and premature germination depended largely on the stage of ripeness and on the treatment given the individual seeds after gathering. The growth of embryos washed free of endosperm juice was much more rapid, the endosperm apparently containing a germination inhibitor. Details of the results are discussed.

The influence of glucose on the production of rootlets by fragments of embryos isolated from nongerminated seeds of Phaseolus vulgaris [trans. title], T. SOLACOLU and D. G. CONSTANTINESCO (*Compt. Rend. Soc. Biol. [Paris], 121 (1936), No. 12, pp. 1212–1215*).—Data are presented on the mechanism of root formation.

The relation of organ size to tissue development in the stem, E. W. SINNOTT (*Amer. Jour. Bot., 23 (1936), No. 6, pp. 418–421, figs. 4*).—In *Todea hymenophylloides*, *Datura stramonium*, and *Pinus strobus*, the relative sizes of pith, vascular cylinder, and cortex were compared in stems of different sizes. Changes in proportions were found to be regular and specific, pith increasing most rapidly.

The optical demonstration of turgor stretching [trans. title], A. FREY-WYSSLING (*Ber. Deut. Bot. Gesell., 54 (1936), No. 7, pp. 445–454, figs. 5*).—To determine in how far the cell wall cooperates passively or actively in the growth stretching of cells, the author used filaments of *Dactylis glomerata* and *Arrhenatherum elatius* and dried material of *Anthoxanthum odoratum*. He concludes that both factors act together, and that the optical test described permits a demonstration as to whether the active cell-wall growth or the passive turgor stretching predominates in any one case.

Studies on the refractive indices of expressed juice in wheat seedlings, K. EBIKO and Y. WATANABE (*Saghalien Cent. Expt. Sta. Rpts., 1. ser., No. 5 (1935), pp. 127–147, pls. 6, fig. 1; Eng. abs., p. 147*).—The refractive indexes averaged higher for winter than for spring varieties and for hardy than for nonhardy varieties. No accurate correlation was noted between the content in total solids of the expressed juice as measured by the refractometer and the monosaccharide content of seedling tissues as shown by chemical analysis.

The effect of potassium supply on the water relations of foliage leaves, L. G. G. Warne (*New Phytol., 35 (1936), No. 5, pp. 403–417, figs. 4*).—Using seakale beet (*Beta cicla*), an additional potash supply induced an increased water content in the leaves when expressed on an area basis and an increase in their potash content which was greater when the potash was supplied as sulfate than as chloride. The leaf content of sulfate or chloride was increased only when the potash was supplied in these forms, respectively. Increases in the potash supply also effected increases in the amount of water imbibed by dried-leaf material, apparently due solely to increases in readily soluble hygroscopic substances.

Additional potash effected an increase in cell size and a decrease in stomatal frequency, and differences in the transpiration rates of pot-grown plants were entirely accounted for by the differences in stomatal frequency. Diurnal changes in stomatal aperture were unaffected by the level of the potash supply. There was no evidence that the osmotic pressure of the cell sap in immature leaves was the factor determining the ultimate size of the leaves.

The blastomycetic method of determining the assimilability of phosphates [trans. title], G. Luchetti (*Bol. R. Ist. Super. Agr. Pisa, 11 (1935), pp. 10–25, figs. 2*).—Results are presented with a modification of the method using the fermentation reactions of *Saccharomyces cerevisiae*.

The migration of solutes, T. G. Mason and E. Phillis (*Bot. Rev., 3 (1937), No. 2, pp. 47–71*).—This is a rather detailed critical discussion of existing experimental evidence and resulting conclusions relating to the translocation of solutes in plants, with 93 citations. Section A deals with the export of mineral elements from the root, B with the export of carbohydrate and mineral elements from the leaf, and C with the interchange of solutes between tissues.

Mineral nutrition and seasonal growth of Ageratum in sand cultures with auto-irrigation, W. L. Norem (*Amer. Jour. Bot., 23 (1936), No. 8, pp. 545–555, figs. 3*).—In an extensive series of studies, "ageratum plants were grown 45 days in automatically wick-irrigated sand cultures in a greenhouse at Baltimore at five different seasons of the year. Nineteen different initial fertilizer treatments were compared in each of the five series." Although there was considerable unexplained variability in the yields, there was no evidence that the order of productivity of the 19 soils tested varied with respect to season.

Micellar structure of the tracheide wall in certain woods in relation to morphogenetic and mechanical factors, J. C. Mary (*New Phytol., 35 (1936), No. 5, pp. 432–455, pls. 2, figs. 6*).—The correlation of percentage of longitudinal shrinkage over a given range of percentage fiber saturation with the mean slope of certain spiral slits and microscopic fibrillae in the tracheid walls of 16 species of coniferous woods was confirmed, and the detailed findings in these and related phenomena are discussed in detail, including comparisons with oak wood.

A special apparatus is described for measuring minute dimensional changes in wood and other rigid hygroscopic bodies with changes in relative air humidity, including thermostatic and hygrostatic control (largely automatic).

Some observations on the problem of vessel length determination in woody dicotyledons, W. R. C. Handley (*New Phytol., 35 (1936), No. 5, pp. 456–471, pl. 1, figs. 4*).—Using maceration methods, vessel segments were found in both ring and diffuse porous woods which appeared to be vessel terminations. In some cases, when vessels had been injected with suspensions,

similar segments were seen to behave as such at the termination of the injection, but the method of sectioning cannot be relied upon to determine whether injection fluids have reached the end of the vessel.

All the injection tests confirmed the view that there is a fundamental difference in vessel length between ring-porous and diffuse-porous types of wood, and this conclusion was confirmed by a simple experiment with coal gas under pressure.

Regeneration from mutilated leaves in monocotyledons, E. E. Kemp (*Notes Roy. Bot. Gard. Edinb., 19 (1936), No. 93, pp. 187–190, pl. 1*).—Successful results were obtained with *Gasteria* spp., *Drimiopsis kirkii, Sansevieria zeylanica,* and *Zamioculcas* spp. The results indicated that either a meristem is present throughout the leaf before mutilation, or that subsequently certain cells regain a meristematic character.

Stomata and altitude [trans. title], H. Spinner (*Ber. Schweiz. Bot. Gesell., 46 (1936), Festband Rübel, pp. 12–27, figs. 8*).—The author presents data on the number of stomata per square millimeter on the upper and lower surfaces of the leaves of a large number of plant species at various altitudes.

A new apparatus for constant temperature, R. E. Coker and E. W. Constable (*Science, 84 (1936), No. 2191, pp. 581, 582*).—This describes a relatively inexpensive multiple-chambered constant temperature apparatus in which a nonfreezing fluid from a single refrigerating chamber circulates through other chambers, each provided with a simple thermostatically controlled heating unit (light bulb).

Stop-cocks for mechanical operation, C. F. Winchester (*Science, 84 (1936), No. 2185, pp. 443, 444, fig. 1*).—In this contribution from the University of California, mild steel stopcocks with cores of chrome steel are described as having advantages over the more usual glass stopcocks.

The electrically driven ultracentrifuge, J. W. Beams and L. B. Snoddy (*Science, 85 (1937), No. 2198, pp. 185, 186, figs. 2*).—A "vacuum" type of ultracentrifuge driven by electricity and automatically maintaining constant speed is described.

A simple apparatus for the steam method of softening woods for microscopic sections, G. E. Davis and E. L. Stover (*Ill. State Acad. Sci. Trans., 28 (1935), No. 2, p. 87*).—A steam boiler of about 1 qt. capacity, fitted with a water gage, an outlet for the steam, and an opening for refilling, permits the playing of live steam on the wood while it is being cut.

Technique for preparing microscopic sections of woody stems and roots, W. W. Newby and P. Plummer (*Bot. Gaz., 98 (1936), No. 1, pp. 198, 199*).—The method described is similar to the one used in preparing slides of petrifactions. The sections could be examined with an oil immersion lens and photomicrographs made from them, and the best results were obtained without staining.

Metal slide mounts for microscopic objects, W. D. Courtney (*Helminthol. Soc. Wash. Proc., 3 (1936), No. 2, pp. 72–74, figs. 2*).—A description is given of the construction of metal slide mounts in which the specimens are held between two cover glasses.

Recent advances in the standardization and improvement of biological stains, H. J. Conn (*Bot. Rev., 3 (1937), No. 2, pp. 72–83*).—A historical account of the development of stain certification in America by the Commission on Standardization of Biological Stains is followed by a discussion of recent developments in counterstains and nuclear stains, with references to the literature.

GENETICS

Recent advances in cytology, C. D. DARLINGTON (*Philadelphia: P. Blakiston's Son & Co., 1937, 2. ed., pp. XVI+671, pls. 16, figs. 160*).—In this revision of the work previously noted (E. S. R., 68, p. 749), the whole account has been recast in terms of evolution. Mitosis is shown as giving rise to meiosis and sexual reproduction, diploidy to polyploidy in one direction and to complex heterozygosis in another. Structural hybridity is represented as the basis of sexual differentiation, and the conditions of parthenogenesis are deduced from experimental observations of the breakdown of sexual reproduction. As to the other relationships of cell behavior, the most important at present are the mechanical, and special treatment is devoted to arranging our knowledge of chromosome behavior and nuclear and cell division to reveal the laws of movement and to inquire into their causes. "Thus in the cell, mechanics, physiology, and physical chemistry are being brought together to show the unity of living processes."

Chromosome structure in relation to the chromosome cycle, B. P. KAUFMANN (*Bot. Rev., 2 (1936), No. 11, pp. 529–553, fig. 1*).—This is a critical discussion of present conceptions with reference to chromosome structure and chromosome mechanics, accompanied by 127 literature references.

Morphological characters of teosinte chromosomes, A. E. LONGLEY (*Jour. Agr. Res. [U. S.], 54 (1937), No. 11, pp. 835–862, pls. 2, figs. 24*).—Comparisons of the lengths of the chromosomes, the positions of fiber attachments, and the number and position of knobs at midprophase of the pollen mother cells of *Euchlaena perennis*, seven forms of *E. mexicana*, *Tripsacum floridanum*, sorghum, and corn showed that these morphological characters of the chromosomes are of value in studying the relationships of this group of grasses. The comparisons also demonstrated that the chromosome complement of teosintes from southern Guatemala is nearly identical, that northern Guatemalan teosintes are very similar to those of southern Guatemala but have a few characteristics that suggest admixture with corn, and that the chromosomes of annual teosintes from Mexico are almost identical with some of the types of corn. Chromosomes of the tetraploid perennial teosinte are practically knobless, thus setting this species apart from any known annual form. The prevalent terminal knobs of *T. floridanum* and of wild teosintes from Guatemala suggest that terminal knobs may be characteristic of all wild species of the Tripsaceae. Internal knobs on the chromosomes of corn and teosinte were found in certain definite positions in all types examined.

Further notes on pangenesis and the inheritance of acquired characters, C. ZIRKLE (*Amer. Nat., 70 (1936), No. 731, pp. 529–546*).—Continuing the previous studies (E. S. R., 76, p. 175), the author cites ancient and medieval accounts of germ cells, originating from almost all parts of the body, to show that the hypothesis of pangenesis can be traced from Hippocrates in the fourth century, B. C., to the nineteenth century.

How to use the specific formula of heredity, H. H. LAUGHLIN (*Natl. Acad. Sci. Proc., 21 (1935), No. 11, pp. 611–616, fig. 1*).—The use of the specific formula of heredity (E. S. R., 71, p. 29) as applied to Galton's data on the stature of British people is demonstrated.

The probability-resultant, H. H. LAUGHLIN (*Natl. Acad. Sci. Proc., 21 (1935), No. 11, pp. 601–610, pl. 1*).—Based on race horse data, a demonstration is given of the principles which underlie the calculation of the probability-resultant which is the combined effect of several mutually independent factors on the same measured quality.

The mass-pedigree method in the hybridization improvement of cereals, J. B. HARRINGTON (*Jour. Amer. Soc. Agron.*, *29* (*1937*), *No. 5, pp. 379–384*).—The merits of the mass-pedigree method are described from experience therewith at the University of Saskatchewan.

Heat induced tetraploidy in barley, F. H. PETO (*Canad. Jour. Res.*, *14* (*1936*), *No. 12, Sect. C, pp. 445–447, figs. 6*).—A tetraploid sector on a spike of O. A. C. 21 barley was induced by germinating and growing barley for 7 days at 35° C. Tetraploid and diploid florets from the same spike were compared with respect to chromosome pairing and chiasma formation. See an earlier note (E. S. R., 74, p. 470).

Influence of certain oat varieties on their F_1 progeny, F. A. COFFMAN and H. STEVENS (*Jour. Amer. Soc. Agron.*, *29* (*1937*), *No. 4, pp. 314–323, figs. 3*).—A comparison of F_1 oats hybrids with plants of their respective parental lines, made by the U. S. D. A. Bureau of Plant Industry in cooperation with the Idaho Experiment Station, revealed that as measured by their hybrids, oats varieties differ widely, some apparently influencing the size of their F_1 progeny, whereas others do not. The extent of this influence and number of characters affected differ with the variety.

The difference in height between Markton and Black Mesdag and their F_1 hybrid plants was not significant statistically, but the hybrids were significantly taller than varieties crossed with Markton and Black Mesdag. Conversely, Bond hybrids were taller than Bond and more nearly approximated their other parents in height. Markton seemed to lack ability to influence the number of culms per plant in its hybrids, which bore fewer culms than Markton, whereas F_1 hybrids of Bond bore fewer culms than varieties crossed with Bond. Markton and Victoria outyielded their F_1 hybrids and the other parents in order, while Bond hybrids exceeded Bond but most often yielded markedly less than their other parents. Consequently, Bond seemed to depress yield in its F_1 hybrids, the opposite being indicated by results in hybrids of Markton and of Victoria.

Bond resulted from crossing varieties belonging to *Avena byzantina* and *A. sativa*, respectively. Certain characters common to Bond, Victoria, Markton, and Black Mesdag suggest that they all may have a similar origin or all may have resulted from species hybrids, an item of special interest in connection with indications that all apparently influence somewhat the size characters in their F_1 progeny.

Alfalfa inheritance studies in New Jersey, G. W. BURTON (*Jour. Amer. Soc. Agron.*, *29* (*1937*), *No. 7, pp. 600–606, figs. 3*).—The inheritance of several morphological characters and their relation to yield capacity was studied in 100 F_2 progeny of *Medicago falcata* × Hairy Peruvian alfalfa, grown at the New Jersey Experiment Stations on poor heavy Sassafras gravelly loam in 1-gal. stone jars.

Flower color evidently is determined by three genetic factors, the exact mechanism of inheritance not being traced. The stem length of 6-week-old plants, mature plant height, number of stems per plant, leaf index $\frac{\text{width} \times 100}{\text{length}}$, leaf size (width × length), percentage of leaves, date of blooming, seed yield, and root type gave distribution curves closely approaching normal, indicating that a number of genetic factors control expression of these characters. Significant correlation ratio values were obtained between plant yields and each of these characters except flower color. Evidence of linkage between the genetic factors determining yield capacity and plant height, date of blooming, leaf index, and leaf size was presented. That root type is in-

herited was proved quite definitely, and the results indicated that upon the heavier podsolic soils, at least, the well-branched type of root system makes for greater productivity. Those characters and relations studied in field-grown F_2 progenies of this cross and of *M. falcata* × Hardigan alfalfa generally substantiated the above conclusions.

"Round-leaf" cotton: Notes on the appearance and behavior of a peculiar new strain, H. B. Brown and J. R. Cotton (*Jour. Heredity, 28 (1937), No. 1, pp. 45–48, figs. 2*).—Characteristics and behavior in crosses with normal and okra-leaf cotton are described for a mutant strain which appeared in 1930 in Express–317 cotton grown at the Louisiana Experiment Station. Bud sports have appeared on the mutant plants several times. The chromosomes are normal and number the same as in upland cotton.

Inheritance of okra-leaf and round-leaf in upland cotton, T. R. Richmond and R. E. Harper (*Jour. Heredity, 28 (1937), No. 6, pp. 215, 216*).—A note on the data reported above.

The relation between genes affecting size and color in certain species of Nicotiana, H. H. Smith (*Genetics, 22 (1937), No. 3, pp. 361–375, pl. 1, figs. 3*).—In populations derived from *N. langsdorffii* × *N. sanderae*, each color gene studied was found to be linked with genes affecting corolla size. Apparently, a large number of size genes were involved and had effects of comparable magnitude, although none with major effects was detected. Some, if not all, are nondominant in the sense that *Aa* has less effect than *AA*. The size genes were proved to act in a cumulative manner. There was no consistent indication of any interaction between the size genes linked with any two color genes. Linkage was found between the self-sterility locus and size genes.

Inheritance of corolla color in the cross Nicotiana langsdorffii by N. sanderae, H. H. Smith (*Genetics, 22 (1937), No. 3, pp. 347–360*).—Genetic data derived in studies at Harvard University from *N. langsdorffii* × *N. sanderae* (Sutton Scarlet) show the manner of inheritance of the following genes:

P, a basic gene from *N. sanderae*, governs the presence of anthocyanin color in the upper surface of the corolla. I_1 and I_2, dominant, independent cumulative genes from *N. sanderae*, are responsible for most of the segregation of anthocyanin pigment intensity. *P* has a minor lightening effect when heterozygous. *D*, from *N. langsdorffii*, has a diluting effect. *R*, from *N. sanderae*, produces red flower color; *rr* is purple. E_1 and E_2, from *N. sanderae*, govern extension of color onto the outside of the corolla, only the double homozygous recessive showing restricted pigmentation. *G*, from *N. langsdorffii*, controls the presence of chloroplast color; Y_1 and Y_2 may modify the shade of green or yellow. B_1 and B_2, complementary genes from *N. langsdorffii*, cause blue pollen.

Additional evidence is given supporting the linkage between B_1 and the self-sterility locus. Genic associations, indicating possible linkages, were demonstrated between pollen color and intensity, extension and intensity, and between *P* and a plastid modifier. *G* may be located on a chromosome not pairing in the normal manner.

A haploid Marglobe tomato: Practical application of a "short cut" for making pure lines, R. C. C[ook] (*Jour. Heredity, 27 (1936), No. 11, pp. 433–435, figs. 3*).—Since a haploid plant contains only one set of chromosomes and the doubling of this set should produce a plant homozygous for every gene, the author discusses the possibility of securing absolutely uniform strains of tomatoes by self-pollination of a haploid or by vegetative growth from callus tissue.

logical and morphogenetic study of some pineapple varieties and ... mutant and hybrid derivatives, J. M. Capinpin and G. B. Rotor, Jr. (*Philippine Agr., 26 (1937), No. 2, pp. 139–151, pls. 3*).—Based on studies at the University of the Philippines of varieties, mutants, and hybrids, the conclusion is reached that the haploid number of chromosomes in the pineapple is 25. The occurrence of abnormal types with 60 and 75 somatic chromosomes is explained on the basis of abnormal gametes on the egg side. The meiotic behavior of the pineapple appeared normal, for in diploid types the 25 bivalents in the heterotypic metaphase appeared to be the regular feature of chromosome conjugation. The genetic aspects of the problem are discussed in some detail.

Natural hybridization and genetics of flickers (Colaptes), A. Deakin (*Amer. Nat., 70 (1936), No. 731, pp. 585–590*).—Classification was made of the color of the malar stripe, wing, tail, and throat and the presence or absence of a nuchal bar in the yellow-shafted flicker, *C. auratus*, and the red-shafted flicker, *C. cafer*, and 47 hybrids between them. The genes responsible for the differences are postulated.

A repetition of McDougall's Lamarckian experiment, F. A. E. Crew (*Jour. Genet., 33 (1936), No. 1, pp. 61–102, figs. 11*).—A further report (E. S. R., 71, p. 29) on the repetition of McDougall's experiment involving the inheritance of learning ability in rats, in which the author found that the number of errors did not decrease even after 18 generations.

Comparative study of four high tumor lines of mice, J. J. Bittner and W. S. Murray (*Amer. Nat., 70 (1936), No. 730, pp. 443–453, figs. 5*).—Study is reported of the relation of age of dam, litter size, and percentage weaned to the development of mammary carcinoma in four strains of mice which have shown high incidence of cancer. There appeared to be no direct relation of the tumor incidence to breeding behavior when the age of the dam is considered (E. S. R., 75, p. 762).

The spontaneous tumor incidence in mice.—I, "Z" stock × "I" stock, J. J. Bittner (*Jour. Heredity, 27 (1936), No. 10, pp. 391–393, fig. 1*).—Crosses were made between an inbred strain of mice of which 78 percent of the breeding animals developed mammary tumors and a strain showing internal but no breast tumors. When the female parent in the cross was from the mammary tumor stock, 33 of 36 F_1 females developed breast tumors at an average age of 10.4 mo. In the reciprocal cross, 7 of 10 F_1 females developed internal tumors but no mammary tumors. It is suggested that the maternal nature of the inheritance suggests the operation of extra-chromosomal influences in determining mammary tumors.

The detection of a hereditary antigenic difference in the blood of mice by means of human group A serum, P. A. Gorer (*Jour. Genetics, 32 (1936), No. 1, pp. 17–31*).—Agglutination and absorption experiments were conducted between the human group A serum and the blood cells from three inbred and one heterogeneous groups of mice at the University College, London. The results showed that if the tests were conducted at 37° C., it was possible to distinguish various types of mouse blood. In one cross a strong reaction in ability to absorb agglutinins seemed due to a single dominant gene, but modifying factors were assumed as responsible for the reactions obtained by direct agglutination.

Genetics of pituitary and ovary grafts, L. C. Strong (*Jour. Heredity, 27 (1936), No. 6, pp. 218–223, figs. 2*).—Tests were made of the ability of ovarian and pituitary grafts from five inbred strains of mice to survive in interstrain crosses by implantation in the testicles. At autopsy after 14 to 53 days intra-

strain grafts usually persisted, as did those made from parental strains to F_1 hybrids, but the interstrain grafts did not persist. It is considered that the genetic basis for the persistence of the grafts is inherited as a dominant, with the number of factors undetermined.

Morphologic reaction of the anterior pituitaries of mature female rats to prolonged injections of pregnancy urine extracts, J. M. Wolfe (*Anat. Rec., 63 (1935), No. 1, pp. 3–11*).—The influence on the pituitaries of daily injections of 25 rat units of pregnancy urine extract for 140 days to mature female rats was studied at Vanderbilt University. The ovary weights were increased from 150 to 500 mg within 15 to 30 days as estimated from laporotomies. While the weights of the ovaries of some individuals remained stationary after this date, others regressed so that at autopsy the ovarian weights ranged from 25 to 460 mg. Pituitary weights ranging from 10 to 37 mg paralleled the ovarian weights. Vaginal smears were irregular but showed early brief periods of complete oestrum with long dioestrous periods in those females having the largest ovaries. The large ovaries consisted of almost a solid mass of large corpora lutea, and the small ovaries contained more follicles. The pituitaries which had regressed to normal size showed normal percentages of eosinophiles and granules, but these were reduced in the enlarged glands. Basophile cells were depleted of granules and were reduced in all glands.

A comparison of theelin prepared from stallion urine, human urine, and from theelol, with notes on the colorimetric estimation of theelin and theelol, G. F. Cartland, R. K. Meyer, L. C. Miller, and M. H. Rutz (*Jour. Biol. Chem., 109 (1935), No. 1, pp. 213–220*).—Comparative tests showed stallion urine and human pregnancy urine to be equally good sources of theelin and that the colorimetric method was of value for the rapid quantitative *estimation of theelin and theelol in pure solution and semipurified urine* extracts.

Tube-locking of ova by oestrogenic substances, R. Whitney and H. O. Burdick (*Endocrinology, 20 (1936), No. 5, pp. 643–647*).—Experiments with *mice showed that 5 rat units of theelin, 0.2 cc of Amniotin, and 0.3 cc of* Progynon B injected immediately after copulation caused tube-locking of the ova. It is suggested that excess oestrin secretion may cause sterility in this manner.

The effect of estrin on the prostate gland of the albino rat and mouse, D. Weller, M. D. Overholser, and W. O. Nelson (*Anat. Rec., 65 (1936), No. 2, pp. 149–163, pl. 1*).—The daily injection of 40 rat units of oestrin into normal and castrate male rats and mice caused suppression in the height of the epithelium of the prostate and the size of the prostate glands. Injections of antuitrin-S and male hormone with oestrin prevented the loss in weight and height of the epithelium of the prostate.

Endocrine interrelations during pregnancy, H. Selye, J. B. Collip, and D. L. Thomson (*Endocrinology, 19 (1935), No. 2, pp. 151–159, figs. 10*).—Studies of the influence of ovariectomy during gestation in the rat showed that the placentae continued in apparent functional condition, but termination of pregnancy was due to partial involution of the uterus causing excess pressure on the gestation sac. The length of the gestation period seemed to be determined by factors inherent in the placenta, and the placenta must produce corpus luteum hormone in view of the condition of the mammary gland in these cases.

Hormones and evolution, O. Swezy (*Amer. Nat., 70 (1936), No. 730, pp. 498–500*).—Data are presented from the California Experiment Station showing the

number of ova and primordial follicles in the ovaries of rats, some of which were normal, some hypophysectomized, and others injected with pituitary extracts. The results showed that the number of ova and primordial follicles in the hypophysectomized animals far exceeded the number present in the normals or those injected with pituitary extracts. It is suggested that the pituitary hormones have a depressing effect on the new germ cells. An acid extract of the anterior lobe of the pituitary appeared to have a depressing effect on the rat's hypophysis, as the numbers of ova in two animals so treated were equal to those found in hypophysectomized animals.

The reaction of fish to sex hormones, S. E. Owen (*Endocrinology, 20 (1936), No. 2, pp. 214–218*).—The use of fish of the bitterling species, *Rhodeus amarus*, for the assay of various concentrations of prolans, theelin, theelol, and antuitrin–S was tested. The results indicate that the female bitterling is refractory to solutions containing up to 50 mouse units of these substances per liter of aquarium water. The male, while reactive, gives inconstant results. Caution is presented regarding the possibility of antihormone interference resulting from repeated use.

The speed of travel of ram spermatozoa, R. W. Phillips and F. N. Andrews (*Massachusetts Sta. Bul. 339 (1937), p. 21*).—The speed of travel of spermatozoa in the genital tract of the ewe was 12.4 mm per minute as contrasted with 4.83 mm per minute in vitro.

Observations concerning the mechanics of ovulation in the fowl, R. E. Phillips and D. C. Warren (*Jour. Expt. Zool., 76 (1937), No. 1, pp. 117–136, figs. 2*).—From a study by operative technic at the Kansas Experiment Station of 33 normal ovulations in 1- and 2-year-old White Leghorn hens, it was concluded that ovulation was due, at least in part, to pressure resulting from the prolonged tension of the muscle fibers of the follicular membrane, but the stimuli to the contraction of the fibers were not determined. None of the following factors was responsible for follicular rupture: Last-minute deposition of yolk, enzymatic action, vacuolization of cells in the follicular membrane, and blood pressure. Intervals between successive eggs averaged 26.3 hr. and oviposition and the next ovulation, 32.2 min.

FIELD CROPS

[Field crops experiments in Alaska, 1935 and 1936] (*Alaska Sta. Buls. 5 [1936], pp. 7–16, 17, 22–24, figs. 7; 6 [1937], pp. 5–13, 16–19, 36, 37, figs. 4*).—Experiments with field crops (E. S. R., 75, p. 766) continued at the station and Matanuska Substation and reviewed again briefly included variety trials with potatoes, soybeans, forage legumes, and grasses; fertilizer tests with potatoes, bromegrass, and wheat; crop rotations; a comparison of warmed (green sprouted) v. unwarmed seed potatoes; a production test with sugar beets; and costs involved in growing peas and rye, oats, oats and vetch, barley, barley and vetch, and potatoes in a rotation scheme and in ensiling and hay-making operations.

[Agronomic experiments in Idaho, 1936], K. H. W. Klages, H. L. Spence, J. Toevs, W. A. Moss, and R. Knight (*Idaho Sta. Bul. 221 (1937), pp. 16–20, 45, 46, 47, 49, 53–56, figs. 3*).—Work with field crops (E. S. R., 75, p. 616) reported on from the station and substations included breeding experiments with winter and spring wheat, corn, barley, oats, alfalfa, Ladino clover, and crested wheatgrass; variety tests with oats, winter and spring wheat and barley, sugar beets, alfalfa, field peas, potatoes, sweet corn strains, and miscellaneous forage grasses and legumes; cultural (including planting) trials with grasses and clovers; fertilizer tests with alfalfa and potatoes; treatment of alfalfa

with gypsum; crop rotations; and weed control, particularly bindweed, quackgrass, and yellow toad flax. Work of the State seed laboratory is also reviewed. Several lines of research were in cooperation with the U. S. Department of Agriculture.

[Field crops experiments in Kentucky] (*Kentucky Sta. Rpt. 1936, pt. 1, pp. 25–27, 34, 35, 36, 37–40, 53–55, 55–57*).—Agronomic experiments (E. S. R., 76, p. 29) reported on from the station and substations included variety tests with corn, timothy, red and white clovers, and lespedeza; breeding work with corn, red clover, and bluegrass; rotation, nitrogen fertilizer, liming, and curing tests, effects of soil nitrogen content, and a study of nicotine content, all with tobacco; fertilized crop rotations; experiments with bluegrass for pasture and seed production; and pasture experiments.

[Field crops experiments in Massachusetts], W. S. Eisenmenger, K. J. Kucinski, E. B. Holland, R. W. Donaldson, A. I. Bourne, W. G. Colby, H. M. Yegian, E. Bennett, and W. H. Sawyer (*Massachusetts Sta. Bul. 339 (1937), pp. 8–10, 11, 12, 33, 39*).—Agronomic research again reported on briefly (E. S. R., 75, p. 474) included variety trials with potatoes and alfalfa; comparisons of hay seeding mixtures; a frequency of cutting test with alfalfa; pasture experiments; a study of the carbohydrates of bluegrass; the absorption of iron, copper, manganese, and iodine by food plants; comparison of cropping systems, spacing tests, and effects of preceding crops, all with tobacco; and control of cranberry bog weeds.

[Crops research by the Puerto Rico College Station], F. A. López Domínguez, P. R. Kuntz, F. Chardón, F. Méndez, E. M. Salés, J. P. Rodríguez, L. A. Serrano, and C. A. Clavell (*Puerto Rico Col. Sta. Rpt. 1935, pp. 6–8, 10, 60–97, 103, 107–109, 109–111, 114, 115, 149–156, 160, 161, 162, 165*).—Further experiments with field crops (E. S. R., 74, p. 189) reported on from the station and the Isabela Substation comprised variety, spacing, cultivation, irrigation, fertilizer, green manuring tests, and breeding work, all with sugarcane; irrigation trials and breeding work with cotton; fertilizer tests with tobacco, yams, and potatoes; and variety trials with tobacco, sweetpotatoes, peanuts, pigeon peas, legumes for green manure, cassava, taro, and yautias.

[Field crops work in Rhode Island] (*Rhode Island Sta. Rpt. [1936], pp. 9–14, 17–19*).—Progress results are reported from variety tests with potatoes, soybeans, and lawn and turf grasses; fertilizer experiments with potatoes, alfalfa, timothy and lawn and turf grasses including Kentucky bluegrass and varieties and strains of bents; spraying tests with potatoes; residual effects from different levels of fertilizer, and of cover cropping with corn, as shown by yields of mixed hay; effects of crops on succeeding crops; crop rotation; breeding work with alfalfa; control of lawn pests, diseases, and weeds; and seed production of bentgrass varieties and strains.

The need for statistical control in soils experiments, R. H. Walker (*Jour. Amer. Soc. Agron., 29 (1937), No. 8, pp. 650–657, fig. 1*).—The importance of replication and randomization in the design of field experiments, supplemented by appropriate methods of statistical analysis, particularly the analysis of variance method, is emphasized.

Efficiency in field trials of pseudo-factorial and incomplete randomized block methods, C. H. Goulden (*Canad. Jour. Res., 15 (1937), No. 6, Sect. C, pp. 231–241, figs. 16*).—Uniformity data for eight different crops were studied to compare the efficiency of the incomplete and randomized block methods. In general, the incomplete block method gave increases in efficiency, such increases being partially correlated with soil heterogeneity. These increases in efficiency appeared to vary on the average from 20 to 50 percent. In view of

the greater adaptability of these methods to irregularly shaped fields, in addition to greater efficiency, their use can be generally recommended. When the relative efficiency of incomplete and complete block methods was studied in relation to size and shape of plats and blocks, the first method was found to give the greatest gains in efficiency when the incomplete blocks were nearly square and made up of long narrow plats.

A rapid quantitative method of studying roots growing under field conditions, R. E. BLASER. (*Jour. Amer. Soc. Agron., 29 (1937), No. 5, pp. 421–423, figs. 3*).—A modification and improvement of the method of studying root activity originally described by Sprague (E. S. R., 71, p. 616) is outlined and illustrated in this contribution from the Florida Experiment Station.

Crop rotations, I, II (*Washington Sta. Bul. 344 (1937), pp. 74, figs. 8*).—Crop rotation experiments, 1919–34, supplementing earlier work (E. S. R., 45, p. 436) are reported on, with remarks on agricultural and environmental conditions in the Palouse country. A brief statement on the life and work of H. F. Holtz (E. S. R., 65, p. 100), once active in the project, is appended.

I. *Effect of crop rotations on succeeding crops*, E. G. Schafer (pp. 19–50).—In an experiment to determine the merits of various crops in replacing summer fallow in wheat growing and the effect of various rotations on production of succeeding crops, wheat was grown in most of the 22 rotations and on summer fallow and after various crops in rotation. Field peas, corn, sunflowers, and potatoes replaced summer fallow, and oats, barley, and wheat each replaced spring grain in certain rotations. Results concerned primarily with field peas, 1920–25, have been noted (E. S. R., 55, p. 33).

Winter wheat averaged 31.7 bu. per acre, yields varying from 21.2 to 44.1 bu., after summer fallow 42.4 and 44.1, after field peas 31.6 and 32, after corn from 26 to 31, and after sunflowers 21.2 bu. Spring wheat averaged 22.7 bu., from 19.1 to 21.3 after spring wheat, from 18.1 to 21.3 after winter wheat, 31 and 32.4 after field peas, and 29 bu. after red clover. Field peas averaged 19.9 bu. and after winter and spring wheat 19.8 bu. Continuous corn averaged 25.6 bu., field peas 20.2 bu., and alfalfa 3,837 lb. per acre.

When rotations were compared as to value, spring wheat grown continuously with or without manure left less for the grower than wheat grown in rotation. Straight wheat and summer fallow brought a greater annual return than 3-yr. rotations with grain 2 yr. in succession before corn or summer fallow, but this return was less than half of that from a rotation where field peas replaced summer fallow. In every rotation where spring wheat followed winter wheat, returns were lower than where field peas, corn, or summer fallow was used. Two grain crops in succession, whether wheat, oats, or barley, lowered the net returns. Continuous alfalfa gave slightly smaller returns than rotations with sweetclover and greater than those containing red clover. Winter wheat, field peas, spring wheat, corn gave the best return of rotations in which field peas appeared not oftener than once in 4 yr. Comments are also made on the value of crop residues, conserving soil, choosing rotations, and climatic limitations.

II. *Effect of crop rotations on productivity of the soil*, L. C. Wheeting and S. C. Vandecaveye (pp. 51–73).—The effects of several crop rotations, 1919–31, on yields, on the quality of wheat, and on the productivity of Palouse silty clay loam are reported.

Average yields in the several rotations were (1) continuous wheat 25.3 bu.; (2) wheat 44, fallow; (3) wheat 36.6 and field peas 20.8; (4) oats 51, field peas 21, and wheat 33.5; (5) alfalfa 2.47 tons and wheat 33.4 bu., the average of several rotations; (6) field peas 17, red clover green manure 2 yr., and

wheat 3 yr. 30.2; (7) field peas 25.4, sweetclover green manure 1 yr., and wheat 2 yr. 33.9; and (8) winter wheat 37.1 bu., vetch. The last rotation was dropped because of difficulty in eradicating volunteer vetch after plowing. Nitrogen content and quality of wheat, as indicated by yellow berry counts, were closely correlated, $r=-0.7904\pm0.019$.

The greatest wheat yield per crop came from the wheat-summer fallow rotation, yet the field peas-wheat rotation proved most productive in income per acre. All rotations containing two or more different crops except the field peas-red clover-wheat rotation also showed greater acre returns than the wheat-summer fallow rotation.

The nitrogen and carbon contents of the soil in different plats under the same system of management varied greatly but were good on all plats. Nitrogen in relation to carbon was reduced under continuous wheat and increased under the wheat-summer fallow rotation. No clear-cut relationship was evident between the treatment and the present soil condition, so far as total nitrogen and organic matter were concerned. Soil loss by erosion was small, being worst under the wheat-summer fallow system. Vegetation and crop residues covering the soil during winter when erosion is greatest retarded run-off and increased the rate of water absorption.

Crop rotation and tillage experiments at the Northern Great Plains Field Station, Mandan, N. Dak., J. T. SARVIS and J. C. THYSELL (*U. S. Dept. Agr., Tech. Bul. 536 (1936), pp. 76, figs. 14*).—Yields of several important field crops grown from 1915–1934 in a number of crop rotations and receiving various tillage treatments, manure, and green manure are reported and analyzed. Information is also included on agriculture in the section, soils, climatic, seasonal, and other environmental conditions, and on weeds common in the rotations. Early results, 1915–22, have been noted (E. S. R., 53, p. 132).

Average acre yields were for corn 26.3 bu., spring wheat 15.8, oats 32.4, barley 19.4, flax 4.5, potatoes 113.5, winter rye 11.6 bu., and alfalfa 0.75 ton, sorgo 3,443 lb., and corn fodder 3,624 lb. Respective average yields on disked corn ground and on summer-fallowed land were for spring wheat 15.2, 19.8 bu.; oats 31.8, 45.9; barley 21, 28.1; flax 5.7, 4.3; and winter rye 13.9, 21.6 bu. Continuous corn averaged 29.8 bu. and corn on summer-fallowed land 32.5 bu.

Results with corn showed that spring plowing generally is more desirable than any other method under trial. However, in very favorable seasons the yield on fall-plowed land might equal or exceed that on spring-plowed land. Both summer-fallowed and corn ground are better adapted for small grain production. Subsoiling in addition to fall plowing involved more labor and has not increased yields. Spring listing has several advantages and should be practiced on soils in danger of blowing.

Spring wheat in this section should preferably be grown on disked corn ground where the corn can be used as feed for livestock. For wheat-growing alone, summer fallow and wheat would be better, provided wind erosion can be controlled. Wheat on summer-fallowed soil, for the year of crop, surpassed all other methods except disked potato ground. Subsoiling and listing showed no advantage over other tillage practices.

For oats, the most desirable tillage method available in considerable acreage is disked corn ground, but this is usually sown to spring wheat. Oats, like barley, usually is not valuable enough to justify summer fallowing. In rotation with corn and wheat, oats should be planted on spring plowing after wheat and in case feed grain is important and no cash crop is grown, oats should go on disked corn or summer-fallowed ground. Barley in a rotation with corn and oats should be on spring-plowed land after oats. In a feed

rotation, if much corn is needed for silage, both oats and barley could be grown on disked corn ground.

Flax has made highest yields on disked corn ground, spring-plowed corn ground, and either alfalfa or bromegrass sod. On old land, flax apparently has better chances of success if sown on corn stubble or on sod of cultivated grasses. Winter rye has produced highest on disked corn and on summer-fallowed ground. It is usually drilled into grain stubble throughout the area, but station results show that somewhat better results are obtained from plowed stubble.

Winter wheat sown each year usually winter-kills and has not succeeded under any method of tillage. Alfalfa, bromegrass, potatoes, sorgo, and green-manure crops also have been grown in the rotations. Land on which green manures were plowed under was not superior to summer-fallowed land for production of wheat or oats.

Crop regions in Montana as related to environmental factors, L. P. Reitz (*Montana Sta. Bul. 340 (1937), pp. 84, figs. 34*).—Data are presented relative to certain environmental factors as they occur in varying magnitude in different parts of Montana, the regions of production of important crops in the State are indicated, and relationships between crop distribution and various environmental factors are pointed out. Factors described in some detail include altitude, precipitation, temperature, storm paths, wind, snow cover, and hours of sunshine.

Montana may be divided into three climatic zones. In the western zone, west of the Continental Divide and characterized by Pacific coast type of seasonal distribution of annual precipitation, relatively warm winters and cool summers, with less wind, and a narrower range of climatic extremes than the central-mountain and plains zones, in order, fruit and certain truck crops succeed. The central-mountain zone, which in general lies from the Continental Divide eastward to and somewhat beyond the 4,000-ft. contour line, has intermediate seasonal distribution of annual precipitation with from 55 to 70 percent falling in the six summer months and the greatest amount in May and June. Average temperatures resemble those of the western zone but with greater extremes. Annual crops and many annual plants do well. The plains zone includes eastern Montana below the 4,000-ft. contour line and closely approaches Great Plains conditions. From over 70 to 84 percent of the total annual precipitation falls during the summer months, temperatures are relatively high in summer and low in winter, and wind velocity is greater than in other zones. Annual hay and grain, the principal crops, thrive under favorable conditions.

Corn, which ordinarily needs a frost-free season of 100 days or longer, in Montana is found only at relatively low altitudes. Since about 2,800 heat units per frost-free season are required for early varieties to develop normally and mature in Montana (E. S. R., 35, p. 338), corn is practically excluded from crops grown above 3,500-ft. altitude except for fodder. Spring wheat seems to be excluded from areas over 5,500 ft. high, where the frost-free season is shorter than 95 days, or where moisture is deficient, although early maturing varieties have allowed production at high altitudes and where short seasons prevail. Winter wheat is grown mainly in elevations not over 5,500 ft., where the January average is not under 20° F., the frost-free season 90 days or longer, and where from 55 to 75 percent of annual precipitation falls between April 1 and September 30. Oats and barley grow at somewhat higher altitudes and in cooler regions than spring wheat, but otherwise are similar in limitations. Flaxseed has been grown on newly broken land primarily in northern

and northeastern Montana where the elevation is low, moisture limited, and summer temperature high, but the crop does not seem to be particularly drought resistant.

Sugar beets seem confined to below 4,500 ft. and require a frost-free period of at least 100 days, most of the crop being grown below 3,500 ft. where the season is 120 days or longer. They need irrigation, since normal precipitation does not suffice for profitable yields. Potatoes are grown up to 6,000 ft., and if given enough moisture and 90 days or longer in which to mature, and not subject to excessive summer temperatures, early varieties may give satisfactory yields on good soil.

Hay crops grow at practically all altitudes where soil and moisture permit. Native hay is produced under most conditions because of many species included, and the crop of lower elevations and warmer areas may differ much from hay from high altitudes and in cool areas. Tame hays, as alfalfa, clover, and certain grasses, are limited in distribution by low winter temperatures, dry winters, and low total annual precipitation.

Drought survival of native grass species in the central and southern Great Plains, 1935, D. A. Savage (*U. S. Dept. Agr., Tech. Bul. 549 (1937), pp. 55, figs. 27*).—The preliminary survey of drought injury to native grasses, made at Hays, Kans. (E. S. R., 73, p. 771), in the fall of 1934, was supplemented in May and June 1935 by ecological studies repeated in greater detail at Hays and extended to seven other stations. A large percentage of the native grasses in the region was killed by the severe drought of 1933–34.

The original cover on sandy soils was apparently less than on heavier soils, and after the drought the cover usually was correspondingly less on sand. Buffalo grass and blue grama together constitute more than 90 percent of the total vegetation on all except very sandy soils. On the heavier soils only a few scattering plants of tall grasses survived, principally bluestem (western wheatgrass), sand dropseed, and red three-awn (wire grass). Blue grama, adapted to a much wider range of soil textures than buffalo grass, was an important species on all soil textures in all localities studied. On sandy lands the grass associations consisted principally of blue grama, bluestem, and 11 other grasses.

Although soil blowing and overgrazing were harmful, climatic extremes caused much more injury than was traceable directly to grazing. Grass cover on closely clipped areas was better than on lightly clipped areas at two stations. As grazing was intensified, the ground cover of buffalo grass declined in all areas with severe drought, yet the relative proportion of ground cover represented by buffalo grass increased as grazing was intensified. Buffalo grass was the most abundant grass in pastures on heavier soils, and apparently was benefited indirectly by grazing, when not extreme. Blue grama, while less resistant than buffalo grass to clipping, heavy grazing, and perhaps drought, surpassed all other grasses in these respects.

The ground cover of practically all tall grasses was reduced as grazing was intensified, sand dropseed being least injured. In about the same degree as tall grasses, most perennial and biennial forbs declined under grazing and drought. The annual grasses, such as *Festuca octoflora*, *Hordeum pusillum*, *Panicum capillare*, *Chloris verticillata*, and *Munroa squarrosa*, which represented only a small part of the total vegetation, were, like annual forbs, most numerous on heavily grazed and severely damaged pastures where perennial grasses were covered by wind-deposited soil. Although much of the grass was dead, surviving plants were distributed rather uniformly and might be expected to recover rapidly under favorable climatic conditions.

Symposium on pasture and forage crops (*Jour. Amer. Soc. Agron., 29 (1937), No. 6, pp. 427–511, figs. 9*).—The papers in this symposium, held at Atlantic City, N. J., on December 29, 1936, included An Inventory of Forage Species and Their Improvement for Pasture in the Northeastern States, by H. B. Sprague (pp. 427–435) (N. J.); Effect of Maturity on Chemical Composition of Leguminous Forage Plants, by A. J. Pieters (pp. 436–440) (U. S. D. A.); The Influence of Grazing Management and Plant Associations on the Chemical Composition of Pasture Plants, by D. B. Johnstone-Wallace (pp. 441–455), The Influence of Stage of Growth of Corn on the Composition of Silage, by R. G. Wiggans (pp. 456–467) (E. S. R., 71, p. 37), and Interpretation of Variations in Plant Composition in Relation to Feeding Value, by L. A. Maynard (pp. 504–511) (all [N. Y.] Cornell); Technic in Pasture Research, by B. A. Brown (pp. 468–476) ([Conn.] Storrs); The Calcium and Phosphorus Content of Pasture Herbage and of Various Pasture Species as Affected by Fertilization and Liming, by W. H. Pierre and R. R. Robinson (pp. 477–497) (W. Va.) (see below); and Modification of Chemical Composition of Pasture Plants by Soils, by A. R. Midgley (pp. 498–503) (Vt.).

The calcium and phosphorus content of pasture herbage and of various pasture species as affected by fertilization and liming, W. H. Pierre and R. R. Robinson (*Jour. Amer. Soc. Agron., 29 (1937), No. 6, pp. 477–497*).—Samples of pasture herbage and of pure Kentucky bluegrass, white clover, poverty grass, and broomsedge, collected 1931–36 by the West Virginia Experiment Station from variously fertilized and limed plats on two different soils, were examined for calcium and phosphorus, and in some cases total nitrogen and "excess base."

Herbage from the unproductive Dekalb silt loam at Morgantown was only 60 percent as high in phosphorus as that from untreated plats of the fertile Huntington silt loam at Moorefield. Liberal fertilization increased the phosphorus content of the herbage to about the same level, but the percentage increases were 101 and 29, respectively. The calcium content of a mixed herbage seemed to be determined largely by the botanical composition of the pasture, in turn related to the lime and fertilizer treatments. White clover and certain common weeds have much higher calcium percentages than the grasses.

When grown in association on a number of untreated and variously treated plats, white clover averaged 88 percent as high in phosphorus as bluegrass, but 248 percent higher in calcium. Phosphorus fertilization increased the phosphorus content of white clover an average of 10 percent v. 40 percent for Kentucky bluegrass. Broomsedge contained from 68 to 86 percent as much phosphorus and from 54 to 76 percent as much calcium as Kentucky bluegrass. The percentage increase in phosphorus from phosphate fertilization was similar for the two grasses. Liming the acid Morgantown plats increased the calcium percentage in broomsedge by an average of 19 v. 36 for bluegrass. Poverty grass averaged less than 70 percent as high in phosphorus as bluegrass on untreated plats, but about 85 percent on plats receiving much phosphorus. The percentage increase in phosphorus content of poverty grass from phosphate fertilizers approximated twice that for bluegrass. Poverty grass was from 49 to 70 percent as high in calcium as bluegrass. The excess base content of white clover was 195 percent higher than of Kentucky bluegrass (46.3 milligram equivalents per 100 g), whereas broomsedge and poverty grass averaged 67 and 62 percent as high as bluegrass, respectively. Broomsedge and poverty grass averaged 76 and 74 percent, respectively, as high in nitrogen as did bluegrass.

Conclusions were that the herbage from many West Virginia pastures may be inadequate for the phosphorus requirements of the grazing animal, but probably contains, in general, enough calcium.

The minimum and average percentages of calcium and phosphorus for Kentucky bluegrass and white clover obtained in this study were compared with values obtained by others and the phosphorus content of bluegrass discussed in relation to Macy's theory (E. S. R., 77, p. 314). Indications are that the minimum percentage of phosphorus for bluegrass in the vegetative stage of growth approximates 0.16 percent and the critical percentage 0.3 percent.

A comparison of grazing and clipping for determining the response of permanent pastures to fertilization, R. R. Robinson, W. H. Pierre, and R. A. Ackerman (*Jour. Amer. Soc. Agron., 29 (1937), No. 5, pp. 349–359, figs. 2*).—In a comparison of methods of determining yields of permanent pastures, made by the West Virginia Experiment Station and the U. S. D. A. Bureau of Plant Industry, 1932–36, yields obtained by clipping permanent grass showed a progressive decrease in relation to yields obtained by grazing with dairy cattle, yet there was a high correlation in any 1 yr. between yields from clipping and from grazing. In a method suggested, clipped yields may be expressed in terms of grazing units. The response to fertilizer and lime treatments determined by the "difference method" of clipping (obtaining the difference between the yields of temporarily enclosed areas and corresponding grazed areas) was a good measure of the response obtained by grazing. The ratio between weight of oven-dry forage obtained with this method and total digestible nutrients calculated from grazing was 1:0.61.

The spacing of corn in the west central Great Plains, J. F. Brandon (*Jour. Amer. Soc. Agron., 29 (1937), No. 7, pp. 584–599*).—Effects of different spacings of Akron Yellow corn on its yields and the following wheat crop were studied in a 2-yr. rotation of corn and winter wheat at Akron, Colo., by the U. S. D. A. Bureau of Plant Industry, cooperating with the Colorado Experiment Station. From 1924 to 1935, inclusive, 12 crops of corn and 9 crops of winter wheat were grown. Loss of winter wheat crops was attributed to failure of stands through winter killing and insect injury.

The highest 12-yr. average yield of ear corn was 13.3 bu. per acre for plants 24 in. apart in 44-in. rows, a spacing recommended for grain production under similar conditions. The 9.2-bu. average yield from double-spaced rows was 28 percent below the average for 5 spacings in 44-in. row plats. The highest total corn yield, 3,038 lb., was from 12-in. spacing in 44-in. rows, and 18-in. spacing made only a little less. From 12 to 18 in. in 44-in. rows is recommended for silage production in the locality. Corn planted from 30 to 36 in. apart in 44-in. rows averaged about 30 percent ear corn by weight, from 12 to 18 in. about 20 percent, and 24 in. about 25 percent ear corn.

The highest average acre yield of winter wheat for grain, 12.8 bu., came from double-spaced row corn land, compared with 10.8 bu., the average on 5 spacings in 44-in. rows, but the gain in wheat did not more than compensate for the loss in corn. Planting corn in double-spaced rows decreased yields markedly in productive years and did not increase certainty of production in poor years. The total production of ear corn and wheat grain was greatest on land where corn was spaced 24 in. apart in 44-in. rows, and the highest total weights of corn and wheat (grain, stover, and straw) were obtained from land with 12-in. spaced corn in 44-in. rows.

Pure seed requirements in the production of sea island cotton, W. W. Ballard (*Georgia Sta. Circ. 113 (1937), pp. 10*).—Production of sea island cot-

ton in Florida and south Georgia has expanded rapidly during the past 3 yr., due to favorable seasons and unusually low weevil infestation, yet even if satisfactory yields can be produced permanent establishment of sea island cannot be accomplished unless immediate steps be taken to maintain purity of planting seed. Precautions discussed and indicated as necessary to maintain pure seed include not planting closer than 1 mile from short cotton, roguing at least twice, picking seed cotton in clean sacks, using a clean gin and clean storage for both seed cotton and seed, and organization of a one-variety community. This contribution is in cooperation with the U. S. D. A. Bureau of Plant Industry.

Adapting high analysis and concentrated fertilizers to cotton soils, J. J. Skinner, H. B. Mann, E. R. Collins, E. T. Batten, and R. P. Bledsoe (*Soil Sci., 44 (1937), No. 1, pp. 1–22*).—Experiments to determine the factors influencing the effects of concentrated fertilizers on cotton and to compare different concentrated fertilizers with standard strength mixtures were conducted by the U. S. D. A. Bureau of Plant Industry, 1925–36, in cooperation with the North Carolina, South Carolina, Virginia, and Georgia Experiment Stations.

On Cecil clay loam at Youngsville, N. C., Cecil sandy clay at Raleigh, N. C., and Norfolk sandy loam at Goldsboro, N. C., concentrated fertilizers (acid and calcium- and magnesium-free) gave as good results as standard fertilizer in the early years of the experiments, but decreased in efficiency as use continued. On fertile Onslow sandy loam at Holland, Va., fertilizers gave good results during the entire 7 yr. tested. Concentrated fertilizers properly supplemented with limestone and, in some cases, with magnesium usually equaled and often surpassed standard fertilizers. The results as a whole indicated that differences in content of minor elements are unimportant in their influence on the relative efficiency of standard and concentrated fertilizers. The nitrogen sources did not vary widely in effects on cotton when the fertilizers were properly supplemented with limestone. The largest yields generally were obtained with concentrated fertilizers containing acid-forming ammonia salts or soluble nitrogen supplemented with limestone, a finding in keeping with previous results cited by Schreiner and Skinner (E. S. R., 73, p. 313).

Properly formulated double-strength fertilizers evidently may be as efficient as single-strength fertilizers. The data indicated that the use of concentrated fertilizers supplemented properly, best applied simultaneously with planting and in bands to the side of the seed, should give good results and reduce the cost of cotton production.

Fertilizer experiments with cotton on heavy irrigated soils, G. Staten and D. A. Hinkle (*New Mexico Sta. Bul. 248 (1937), pp. 16, figs. 4*).—In a fertilizer test with cotton grown continuously on irrigated soil varying from a very heavy plastic Gila clay adobe to a rather heavy Gila clay loam, 1929–36, 8 yr. of continuous cotton did not cause reduction in yield, trends being generally upward for all treatments. The yield trend for manured plats rose more consistently and faster than for those treated otherwise.

Annual applications of manure at rates of 6.25 tons per acre, 1929–32, and 8.5 tons, 1933–36, increased the average annual yield of lint cotton by 118 lb. per acre (1,030 v. 912 unfertilized), increased average staple length by almost $\frac{1}{16}$ in., produced slightly larger bolls, resulted in a slightly lower lint percentage, and delayed maturity, increasing the late-picked cotton by 5.6 percent. However, these characters were not affected significantly by annual applications of superphosphate 135 lb., ammonium sulfate 150 lb., or a combination of superphosphate 135 lb. and ammonium sulfate 150 lb. per acre when compared with no-fertilizer plats. Potassium sulfate at the rate of 200

lb. per acre, 1936, did not affect any character studied. No fertilizer treatment used seemed to affect prevalence of *Verticillium* wilt.

Effect of age, condition, and temperature on the germination of flaxseed, A. C. Dillman and E. H. Toole (*Jour. Amer. Soc. Agron., 29 (1937), No. 1, pp. 23–29, fig. 1*).—Results of germination tests of flaxseed from 4 to 18 yr. old, of weather-damaged seed, and of seed exposed to high temperatures in the Imperial Valley of California are reported.

In 1936, flax samples grown at Mandan, N. Dak., and from 7 to 14 yr. old, showed very satisfactory germination, while samples from 15 to 18 yr. old were lower in viability, germinating from 50 to 89 percent. Samples grown in 1921 and 1919, respectively, gave a much lower germination than a sample harvested in 1920, a difference possibly due to drought in 1919 and 1921 which forced early ripening before the seed was fully mature. A wet harvest and threshing season in Minnesota and the Dakotas resulted in much weather-damaged flaxseed in 1926. Tests of 41 carlot samples received in Minneapolis indicated that seed of high moisture content, from 10 to 18 percent, was injured in germination.

Flax exposed in a dry condition in the sheaf to the very high summer temperatures of the Imperial Valley was not injured in germination nor in the yield and quality of oil. Germination tests showed that a constant temperature of 35° C. (95° F.) or a temperature of 40° for 6 hr. each day will prevent normal germination of flaxseed. These results appeared to explain failure to obtain a satisfactory stand of flax sown at El Centro, Calif., September 20, 1935, when soil temperatures must have exceeded 100° F.

The development of the oat panicle, O. T. Bonnett (*Jour. Agr. Res.* [U. S.], *54 (1937), No. 12, pp. 927–931, pls. 2*).—The principal stages in the formation of the oats panicle and flower were studied at the Illinois Experiment Station by dissecting the growing points and panicles from stems in different stages of development. See also similar studies on barley and wheat (E. S. R., 76, p. 329).

In the first stage of development of an oats stem, leaves and tillers are produced, and in the second stage the internodes of the stem elongate and the panicle and its parts differentiate and develop. Panicle formation is first indicated by appearance of single, lateral, alternate projections arising in the axils of leaf initials beneath the apex of the growing point, which are the primordia of the branches of the first order. Branches of the second and third order arise from the parent axes in the same manner that branches of the first order arise from the main axis. Spikelets differentiate from the tips of the branch primordia, the differentiation beginning first at the apex of the main axis and proceeding basally on the branches of the first order and in sequence on the branches of the second and third orders. The empty glumes are the first of the spikelet parts to differentiate. The flowers of a spikelet differentiate acropetally; and flower parts differentiate in the order lemma, anthers, palea, lodicules, and pistil. In the pistil the order of differentiation is ovary, styles, and stigmas. Since the main axis and all branches terminate in spikelets, a panicle can be called a determinate inflorescence.

A study of the relative adaptation of certain varieties of soybeans, J. M. Poehlman (*Missouri Sta. Res. Bul. 255 (1937), pp. 43, figs. 6*).—Morse soybeans have outyielded Virginia soybeans when grown under similar favorable conditions, whereas, in general, Virginia outyields Morse under unfavorable growth conditions. This reversal in relative yields has been associated with a change in growth type in Morse from upright and branching to a low and bushy form. The phenomenon is associated with soil type, but the associa-

tion has not been consistent. Pot experiments involving several soil types, soil and sand mixtures, and soil moisture and fertility levels failed to confirm results of field experiments. The relative significance of season, soil moisture, temperature, and light, especially length of day, in regard to the phenomenon is discussed. Studies of their expressed plant juices (E. S. R., 73, p. 451) revealed no significant differences between the two varieties. It is concluded that more extended and complete study of the various factors involved would be required by this problem.

Soybean production in Michigan, C. R. Megee (*Michigan Sta. Circ. 161 (1937), pp. 14, figs. 3*).—Practical information is given on the status of the soybean crop in Michigan and its uses as an emergency hay crop, for silage, in the form of soybean oil meal, as a supplementary protein feed, soil improver, and as a cash crop, with recommendations on varieties and suitable cultural methods and field practices. Industrial and commercial uses also are listed.

Better planning for field experiments with fertilizers, R. J. Borden (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 41 (1937), No. 2, pp. 99–109, figs. 2*).—Particular attention is given to the design of fertilizer experiments for sugarcane and to the handling of phosphate, potash, and nitrogen problems.

Phosphate deficiency, R. J. B[orden] (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 41 (1937), No. 2, pp. 85, 87–89, figs. 3*).—The early, greatly stimulated root and shoot development of sugarcane resulting from the application of a phosphate fertilizer with the seed at planting is illustrated. Lack of stooling is shown to be a rather definite symptom of phosphate deficiency when the green leaf color indicates enough nitrogen.

Improving the protein content of timothy (Phleum pratense) by application of soluble nitrogen fertilizers 10 to 20 days before harvest, H. B. Sprague (*Jour. Amer. Soc. Agron., 29 (1937), No. 7, pp. 607, 608*).—A brief report is made from the New Jersey Experiment Stations on the substantial increase in the crude protein content of timothy obtained by applying different nitrogen carriers from 10 to 20 days before harvest.

The relation of awns to the productivity of Ohio wheats, C. A. Lamb (*Jour. Amer. Soc. Agron., 29 (1937), No. 5, pp. 339–348*).—An Ohio Experiment Station study on 3,695 bearded and 4,590 beardless spikes of wheat from 8 segregating populations, 1932–34, indicated a probable slight yield increase resulting from the presence of the awn. However, for practical purposes the advantage was negligible, and there seemed to be no reason for carrying awned selections in the breeding nursery. Contradictory evidence of other investigators on the value of awns is also discussed.

Wheat seeding, C. A. Lamb (*Ohio Sta. Bimo. Bul. 187 (1937), pp. 115–118*).—Essentials for production of superior soft red winter wheat include a variety such as Trumbull, Fulhio, and Gladden; clean seed treated for seed-borne diseases; adequate seedbed preparation and a reasonable fertility level; and planting on or as soon after the fly-free date as possible.

Comparison of the cold resistance of several varieties of winter wheat in transition from dormancy to active growth, H. H. Laude (*Jour. Agr. Res. [U. S.], 54 (1937), No. 12, pp. 919–926, figs. 3*).—The comparative cold resistance of Minturki, Kanred, Quivira, Turkey, Blackhull, and Harvest Queen winter wheats was studied at the Kansas Experiment Station during transition from the winter to the spring stage of growth, induced by transferring naturally hardened plants in the winter from outdoors to the greenhouse. Although cold resistance was usually lost more rapidly in varieties

possessing greater midwinter hardiness, the contrary was also found. Harvest Queen lost resistance to cold more slowly than the other varieties, and thus retained a relatively high degree of resistance into the spring growth stage. This character may be important in protecting the crop against injury from early spring freezes. No relation between rate of transition and time of maturity was observed.

Cold resistance of winter wheat, rye, barley, and oats in transition from dormancy to active growth, H. H. Laude (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 12, pp. 899–917, figs. 8*).—The changes in cold resistance during transition from dormancy to active growth were studied at the Kansas Experiment Station in wheat, rye, barley, and oats for the 1932–33 and 1933–34 seasons. Transition changes were induced when winter-hardened plants grown outdoors were transferred into a greenhouse with a favorable growth environment. Relative cold resistance and changes in resistance were measured by artificially freezing the plants at various stages in the transition.

Transition under the control provided was faster, but comparable otherwise to winter-spring transition in the field. Temperature seemed to have been the chief factor influencing the rate of transition. Change in cold resistance proceeded at a decreasing rate except for about 12 hr. just after placement in the greenhouse. As soon as the plants were stimulated into activity their cold resistance decreased very rapidly, the rate of change being greatest during the first part of transition and gradually slowing until after 2 weeks little change was taking place. In the hardened condition, Dakold rye was considerably more resistant to cold than Kanred wheat, Tennessee barley, and Sporen oats, in order, but after 9 days in the greenhouse little difference in cold resistance remained. All had lost resistance, and the hardy rye evidently had lost more than the others and wheat more than barley and oats.

The water content of the plants increased and total solids in the sap decreased during the transition, rapidly at first and then slower until about the ninth day, after which little change occurred. The amount of juice expressed from leaves increased at a constant rate throughout transition, suggesting that a change in bound water to free water continued after the maximum water content was attained. Cold-resistance changes were associated negatively with water content, refraction of sap, and pressed juice during the first half of the transition period and similarly associated with pressed juice during the last half.

Increasing the speed of reading germination tests, W. Crosier and S. Patrick (*Farm Res.* [*New York State Sta.*], *3* (*1937*), *No. 4, pp. 8, 14, 15, fig. 1*).—An organic mercury compound diluted with certain dusts, used to treat seeds to be tested for germination, surpassed other materials tried in respect to normal seedling development, germination percentage, freedom from micro-organisms, and cost of application.

The winterhardiness of weeds, S. T. Dexter (*Jour. Amer. Soc. Agron.*, *29* (*1937*), *No. 6, pp. 512–517*).—Samples of rhizomes from fertilized and unfertilized quackgrass, roots of Canada thistle and field bindweed, and crowns of downy bromegrass were collected weekly during the fall at the Michigan Experiment Station. Tests indicated that they became more hardy as cold weather came on. Canada thistle was found to be relatively susceptible to injury by freezing. When photosynthesis was prevented in the fall, quackgrass fertilized with nitrogen failed to harden, while unfertilized quackgrass rhizomes hardened considerably, although not as well as if photosynthesis was permitted. Alfalfa roots and crowns could withstand lower temperatures than Canada thistle or bindweed roots. Quackgrass rhizomes from unfertilized

hardier than those from fertilized plats. The applicability of these principles in control of quackgrass on a field scale is discussed.

HORTICULTURE

[**Horticulture at the Alaska Station, 1935 and 1936**] (*Alaska Sta. Buls. 5 [1936], pp. 24–26; 6 [1937], pp. 20–22, 26–36, 37–39, figs. 7*).—Herein are presented the results of studies upon the variety and culture of small fruits, possible causes of failure of fruit trees to survive, varieties and propagation of ornamentals, varieties and fertilizer requirements of canning peas, effect of fertilizer and variety on the chemical composition of canning peas, and culture and varieties of vegetables.

[**Horticultural studies by the Idaho Station**], L. VERNER (*Idaho Sta. Bul. 221 (1937), pp. 35–38, fig. 1*).—Brief reports are presented on the results of trials of various fruit species and vegetables on old orchard soil, on apple breeding, on the causes of cracking of sweet cherry fruits, and on the effects of the severe winter of 1935–36 on various fruits such as apple, cherry, plum, and apricot.

[**Horticultural investigations conducted by the Kentucky Station**] (*Kentucky Sta. Rpt. 1936, pt. 1, pp. 43, 44, 57*).—Included are brief reports on cover crop and cultural trials with apples, on the effect of drought on the soluble nitrogen and phosphate phosphorus content in the conducting tissues of the bean plant, and on methods of planting lima beans.

[**Horticultural investigations conducted by the Massachusetts Station**] (*Massachusetts Sta. Bul. 339 (1937), pp. 13, 31, 32, 39, 40, 41, 64–66, 73–85, 91*).—Included are brief progress reports on the following studies: Onion breeding, by W. G. Colby and H. M. Yegian; moist mats for clay pots, by L. H. Jones; cold storage of cranberries, by C. I. Gunness, H. J. Franklin, and C. R. Fellers; development of strains of cranberry resistant to false blossom, effects of copper on the growth of cranberry vines, and spraying and dusting of cranberries, all by H. F. Bergman and W. E. Truran; breeding snapdragons for varietal improvement and disease resistance, the effect of nutrients, soil reaction, and light on gardenias, propagation of gardenias and geraniums, and fertilizers for carnations, all by H. E. White; use of tin pots for merchandizing roses and other plants in full growth, and testing of ornamentals for hardiness, both by G. Graves; testing of seed sold in packets, by G. B. Snyder and A. P. Tuttle; varieties of lettuce, sweet corn, and tomatoes, by Tuttle, Snyder, and P. W. Dempsey; varieties and culture of asparagus, and improvement of vegetables by breeding and selection, both by R. E. Young; training of tomatoes, by Young, Dempsey, H. A. Wilson, and Tuttle; Pascal celery storage, by Young; the interrelation of stock and scion in apples, and influence of various clonal stocks on apple varieties, both by J. K. Shaw; tree characters of fruit varieties, by Shaw and A. P. French; genetic composition of peaches, by J. S. Bailey and French; cultural and fertilizer studies with the apple, by Shaw; varieties of fruit, by Shaw et al; fruit bud formation in the strawberry, by R. A. Van Meter; bud mutations in the apple, by Shaw and W. H. Thies; storage of apples, by O. C. Roberts; the removal of arsenic and lead residues, by Roberts and Shaw; nutrition and culture of the highbush blueberry, by Bailey; and causes of premature dropping of the McIntosh apple, by L. Southwick.

[**Horticultural investigations conducted by the Puerto Rico College Station**] (*Puerto Rico Col. Sta. Rpt. 1935, pp. 8–10, 98–103, 104, 121–134, 157–160, 161, 162*).—Progress reports are presented on investigations relating to fertilizer and shading requirements of coffee, and varieties of coffee, all by J. G. Ar-

rillaga; culture of coconuts, and varieties of pole beans, both by F. Méndez; rootstocks for citrus, propagation of oranges, mangoes, avocados, and miscellaneous fruits, and varieties of mangoes and avocados, all by J. S. Simons; and fertilizer requirements of peppers, tomatoes, and eggplants, varieties of tung-oil trees, culture of onions and garlic, and production of vegetable seed, all by L. A. Serrano and C. A. Clavell.

[Horticultural investigations by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1936], pp. 14–17, 19–25, 29, 30*).—In a brief manner there are considered the results of fertilizer studies with various market garden crops, strain and variety tests with various vegetables such as lettuce, cabbage, tomatoes, celery, beets, beans, and spinach, comparison of loam and sandy types of soil for celery and tomatoes, treatment of vegetable seeds and the soil with disinfectants, fertilizer requirements of *Daphne cneorum* and other ornamentals, influence of sprays on carbon dioxide assimilation of apple leaves, testing of various apple sprays, effect of spacing on the growth of strawberry plants, carbon dioxide assimilation by the tomato, breeding of blackberries, testing of plum varieties, the nutrition of the blueberry, the culture of *Daphne* and of a bamboo species from China, the growing of poplar for farm wood supply, and the determination of quality in vegetables by physiological methods.

[Horticulture at the Dominion Experimental Station, Summerland, B. C.] (*Canada Expt. Farms, Summerland (B. C.) Sta., Results of Expts., 1932–36, pp. 4, 6–24, figs. 2*).—Included in this report are the results of investigations in orchard soil management, irrigation, variety tests of tree and bush fruits, breeding of fruits, testing of apple and pear rootstocks, planting, grafting, pollination, pruning, fruit thinning, harvesting, storage of fruit, fruit products, vegetable growing, and testing of ornamental plants.

New uses for fruits and vegetables, D. K. Tressler (*Farm Res. [New York State Sta.], 3 (1937), No. 4, p. 11*).—Among subjects discussed in this, the second of two articles (E. S. R., 77, p. 189), are the drying of apple sauce, preparation of unfermented fruit and vegetable juices, clarification and carbonation of cider and other juices, preparation of rhubarb juice and fruit-juice concentrates, and of apple pectin.

Cauliflower and heading broccoli production, J. H. Beattie (*U. S. Dept. Agr. Leaflet 130 (1937), pp. 6, figs. 2*).—Brief general information is presented.

The culture of table beets, J. H. Beattie (*U. S. Dept. Agr. Leaflet 127 (1937), pp. 4*).—Information is offered concerning culture, harvesting, marketing, etc.

Production of carrots, J. H. Beattie (*U. S. Dept. Agr. Leaflet 125 (1937), pp. 4*).—Among subjects discussed are soils, varieties, general culture, disease and insect enemies, storage, etc.

Muskmelon breeding a year round project, W. D. Enzie (*Farm Res. [New York State Sta.], 3 (1937), No. 4, p. 12, fig. 1*).—Following a study of over 200 varieties, breeding was begun in an effort to combine certain desirable characteristics in new seedlings. The program includes inbreeding for two or three generations to secure uniformity and then crossing. A brief description is given of the flowering habit of the muskmelon and of methods employed in producing new varieties.

Production of eggplant, J. H. Beattie (*U. S. Dept. Agr. Leaflet 131 (1937), pp. 4*).—This includes general cultural information.

New York's hop industry is forging ahead, J. D. Harlan (*Farm Res. [New York State Sta.], 3 (1937), No. 4, pp. 12, 13, fig. 1*).—A steady increase is indicated in acreage and number of hop growers. Wide differences were noted in the lupulin content, suggesting possibilities of varietal treatment, and an increasing interest in cooperative kilns was manifested.

Production and preparation of horseradish, W. R. BEATTIE (*U. S. Dept. Agr. Leaflet 129 (1937), pp. 6, figs. 2*).—This is a presentation of general information.

Rhubarb production, J. H. BEATTIE (*U. S. Dept. Agr. Leaflet 126 (1937), pp. 4*).—Brief cultural comments are presented.

Production of spinach, J. H. BEATTIE (*U. S. Dept. Agr. Leaflet 128 (1937), pp. 8, figs. 3*).—General information is presented on varieties, soils, fertilizers, culture, harvesting, etc.

A new experiment with tomato plants, C. B. SAYRE (*Farm Res. [New York State Sta.], 3 (1937), No. 4, p. 16, fig. 1*).—In this preliminary discussion the author reports that locally grown greenhouse and coldframe tomato plants showed much better survival than did Virginia- and Georgia-grown plants.

The necessity of minor elements for the growth of tomatoes in a poor soil, J. S. MCHARGUE and R. K. CALFEE (*Jour. Amer. Soc. Agron., 29 (1937), No. 5, pp. 385–391, figs. 2*).—A more detailed account than that previously noted (E. S. R., 77, p. 482).

Type and severity of fruit cracking in tomato varieties, W. A. FRAZIER (*Amer. Soc. Hort. Sci. Proc., 33 (1936), p. 536*).—Observations in 1936 at the University of Maryland on a total of 70 varieties and strains of tomatoes growing in the field showed appreciable and consistent differences in cracking tendencies in certain varieties. Environmental factors, such as rainfall, were even more potent than varietal. Among the varieties showing deep radial cracking were Marglobe, Bonny Best, John Baer, Nystate, Chalks Red Jewel, and Early Detroit. Most early varieties, such as Earliana, Penn State, June Pink, and Landreth Sunrise, were more susceptible to concentric cracking than were the late varieties. Relative freedom from both radial and concentric cracking was noted in Pear Shaped Red and Brown Special.

The effect of storage on tomato quality, F. C. GAYLORD (*Canner, 85 (1937), No. 7, pp. 12, 13, fig. 1*).—Continued studies by the Indiana Experiment Station (E. S. R., 76, p. 628) gave further evidence that tomatoes deteriorate quickly when kept in storage and that the loss is proportional to the percentage of No. 1's. Lots with considerable greenish fruit may actually increase in quality because of ripening after picking.

Fruits, old and new and northern plant novelties, N. E. HANSEN (*South Dakota Sta. Bul. 309 (1937), pp. 16*).—Herein are presented lists of varieties of fruits recommended for planting in South Dakota and notes on fruits, flowers, and field crops regarded as of promise.

Storage experiments with pollen of cultivated fruit trees, B. R. NEBEL and M. L. RUTTLE (*Jour. Pomol. and Hort. Sci., 14 (1937), No. 4, pp. 347–359, figs. 7*).—At the New York State Experiment Station, pollen taken from anthers allowed to dehisce in open Petri dishes was transferred to shell vials loosely stoppered with cotton wool, and these, in turn, were placed in desiccators in a dark storage chamber held at from 2° to 8° C. The desiccators were maintained at calculated relative humidities of 50, 60, 70, 80, 90, and 100 percent. The duration of life was increased as the relative humidity was decreased, and at 50 percent apple and sour cherry pollens showed good germination after more than 2 yr. of storage. The indications were that pear, plum, peach, sweet cherry, and grape pollens would also keep for 2 yr. Stored pollen was found potent wherever it was shown to possess good vitality in germination tests. Apple pollen which had apparently lost viability after storage in the laboratory for 5 weeks was revived by being placed in storage at from 2° to 8° and a relative humidity of 80 percent.

Low temperature injury to orchards in Pennsylvania and adjoining States in the fall and winter of 1935–36, R. D. ANTHONY, R. H. SUDDS,

and W. S. CLARKE, JR. (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 33–43, fig. 1*).—The results are presented with discussion of a survey of widespread winter injury to fruit trees in Pennsylvania and adjacent areas. The greatest injury occurred in an elliptical area centering roughly around Pittsburgh and extending 50 miles north, 25 miles south, 75 miles east, and with a somewhat indefinite western border in Ohio. A heavy crop in 1935, an untimely freeze in early October which checked normal maturation, and a sudden drop in temperature in January combined to form a critical situation. Low temperature alone is not considered the primary cause, because some of the orchards had passed safely through much colder winters. In general, those tissues which are slowest to attain maturity, namely the bases of buds, large crotches, and lower limbs, were most severely injured. Both excess vigor and lack of vigor were contributing factors, while the time and amount of fertilizer applications seem to have influenced the degree of injury only as they affected the maturity of the trees.

The condition of apple trees in western Illinois following the severe winter and drouth, V. W. KELLEY (*Ill. State Hort. Soc. Trans., 70 (1936), pp. 456–471, figs. 9*).—Following a brief discussion of the climatic conditions associated with injury, the author describes types of injury, discusses probable factors affecting injury, and presents suggestions for aiding recovery.

Soil erosion in Michigan orchards, N. L. PARTRIDGE (*Michigan Sta. Circ. 162 (1937), pp. 35, figs. 24*).—Incidental to various orchard soil management studies conducted by the station since 1920, there were collected many data and photographs relating to the prevalence and effects of soil erosion in orchards, vineyards, and other fruit plantations. In this circular there are assembled some of the more pertinent facts, accompanied by a discussion of various methods of reducing and preventing erosion losses. Erosion due to washing and blowing is said to be a serious factor in many Michigan orchards. Continuous cultivation contributes to erosion losses, while permanent sod covers are considered the cheapest and most effective method for controlling erosion. Where cultivation is required, protective strips of sod may be left in each tree row. Mulching heavily with grass or other material about the trees is also an effective substitute for cultivation. The control of erosion in orchards is of necessity a compromise between the most effective method of soil retention and the best method of soil management as related to economic production. The fact is emphasized that orchards should be established on soils which have not been subjected to serious erosion in the past.

Ringing and fruit setting as related to nitrogen and carbohydrate content of Grimes Golden apples, L. GREENE (*Jour. Agr. Res. [U. S.], 54 (1937), No. 11, pp. 863–875, fig. 1*).—In studies by the Indiana Experiment Station, the early ringing of branches on vigorous 8-year-old trees growing under clean cultivation and cover-crop system of management resulted in an approximate doubling in the percentage of spurs that set fruit. Scoring the branch by drawing a knife blade twice around the limb without removing the enclosed bark was also effective. Ringing and scoring apparently increased the average number of fruits per spur. Ringing had relatively less effect on branches that tended to set fruit abundantly. There was a considerable period of time during and following blossoming in which ringing was influential on fruit setting. Ringing increased the weights of apple spurs, particularly the reproductive organs and the cluster base. Spurs from ringed branches were higher in sugar and starch than those from comparable nonringed branches. Sucrose was influenced less by ringing than was the content of reducing substances. Leaves from ringed branches were consistently higher in total sugars, but this did not

hold true for other spur parts. On a dry-weight percentage basis, spurs of nonringed branches had a slightly higher nitrogen content except that the fruits remained fairly constant between treatments. Carbohydrate accumulation was apparently of importance in preventing the excessive dropping of fruits.

Boric acid injections prove injurious, W. O. GLOYER (*Farm Res.* [*New York State Sta.*], *3* (*1937*), *No. 4*, *p. 14*, *fig. 1*).—The insertion of boric acid crystals into the trunks of 10-year-old Baldwin apple trees almost ruined the trees. Spiral streaks of dead bark were formed, and any branches in the path of the streak were killed. Varieties apparently differed somewhat in their susceptibility to boron injury. The difference between drought spot and stippen is indicated.

Three distinct stages traced in the growth of fruit, H. B. TUKEY (*Farm Res.* [*New York State Sta.*], *3* (*1937*), *No. 4*, *pp. 1*, *15*, *fig. 1*).—The author points out that in the stone fruits, notably the peach, cherry, apricot, and plum, there are three separate and fairly characteristic periods of fruit growth: (1) A *period of rapid initial development*, (2) a *period of delayed development*, and (3) the final swell. Early-maturing varieties have relatively short periods of delayed development. The bearing of the periodic development on thinning is discussed, with the suggestion that in late-ripening peaches, such as Hill Chili, thinning may be deferred much later than in a variety like Greensboro.

The results of 50 years of breeding cherries, G. H. HOWE (*Farm Res.* [*New York State Sta.*], *3* (*1937*), *No. 4*, *pp. 3*, *9*).—This the third of a series of articles (E. S. R., 77, p. 190) on new and noteworthy fruits, discusses the Senaca and Gil Peck sweet cherries originated by the station and other cherries, such as Geant d'Hedelfingen, Royal Duke, and Chase, which are considered especially well worth-while. Pollination requirements and rootstocks are briefly discussed.

New peach varieties, M. J. DORSEY (*Ill. State Hort. Soc. Trans.*, *70* (*1936*), *pp. 241–247*).—In this brief paper, the more recent introductions are rated according to their hardiness and discussed in view of their potential value.

Research investigations with strawberries at Montrose, Iowa, T. J. MANEY, B. S. PICKETT, and P. A. MINGES (*Iowa State Hort. Soc. Rpt.*, *70* (*1935*), *pp. 41–44*, *figs. 2*).—With a view to studying varietal adaptation and response to soil treatment, an experiment was laid out by the Iowa Experiment Station near Montrose. In the spring of 1935 plats receiving stable manure or phosphorus alone were apparently more productive and superior in condition. A spring application of 800 lb. of 5–7–7 fertilizer to Dunlap plants stimulated growth and apparently increased resistance to leaf spot, but the yields were decreased in comparison to the no-fertilizer plats. The U. S. Department of Agriculture varieties—Dorsett, Fairfax, Narcissa, and Blakemore—showed up to advantage. Among everbearers, Mayzata and Mastodon were superior.

Breaking the rest period of the strawberry by long days at high temperatures, G. M. DARROW (*Science*, *85* (*1937*), *No. 2207*, *pp. 391*, *392*).—Observations at the U. S. D. A. Research Center, Beltsville, Md., on the responses of strawberries to differential photoperiod and temperature levels during the winter season indicated that long days at high temperature may be fully effective in breaking the rest period. The plants were brought into the greenhouse from the field on September 1, November 15, and January 1, and measurements of leaf area were made on March 2. At 70° F. all varieties developed approximately the same leaf area under 16- and 14-hr. day lengths. Under normal days the September 1 and November 15 groups behaved similarly and were still at rest, while the January 1 group developed considerable leaf area, indicating that its rest period had been broken. At 70° and 16- and 14-hr.

day lengths the September 1 plants did not undergo any rest period, and that of the November 15 lot was broken. At 60° and 16 hr. of day, the September 1 plants did not undergo rest, but at 60° and 14 hr. the September 1 group went into a rest period and the November 15 group did not have its rest broken. The fact that the strawberry plant retains green leaves during the dormant season is said to permit light to take effect so that long days with high temperatures are effective in breaking the rest period.

Handling strawberry plants to avoid losses, M. B. Hoffman and J. A. Evans (*N. Y. State Hort. Soc. Proc., 82 (1937), pp. 267-270*).—Stating that serious losses have occurred in new plantings of strawberries received from southern sources, apparently due to winter-injured roots, the authors present the results of a study of plants obtained at different dates and handled in different ways after reception. The best results were secured with plants received March 28, held in cold storage at 31° F., and planted April 14. The poorest results were secured with plants received May 7 and set immediately in the open. The use of dormant plants set early is conceded to be a good practice, although perhaps not a complete solution of root rot troubles.

Aphis resistance in breeding mosaic-escaping red raspberries, C. D Schwartze and G. A. Huber (*Science, 86 (1937), No. 2224, pp. 158, 159*).—Having observed that Lloyd George variety completely escaped mosaic infection in the Puyallup Valley by virtue of its resistance to the aphid vector, *Amphorophora rubi* Kalt., and that this variety transmits resistance when crossed with susceptible kinds, careful records were made by the Washington Experiment Station on 10 red varieties in the field, with evidence that the rate of spread of mosaic appears directly proportional to the aphid populations present. In the greenhouse, aphids were unable to maintain themselves on Lloyd George. Of 31 reciprocal hybrids between Lloyd George and Cuthbert, 6 proved completely resistant and several others highly resistant. Of 6 hybrids between Lloyd George and Latham, 3 were resistant and 3 susceptible. Of 19 hybrids of susceptible parents, all were definitely susceptible. The authors believe that the failure of the aphid above mentioned to infest Lloyd George is due to a lack of suitable food in the plant rather than the presence of repellent substances.

Hastening the production of fruit in grape hybridizing work, E. Snyder and F. N. Harmon (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 426, 427, fig. 1*).—The details are presented of a method of technic, using the T bud with some modifications, whereby ripe fruits have been produced 18 mo. after the grape seeds were planted in the greenhouse flats.

Breeding hardy muscat grapes, R. Wellington (*Amer. Soc. Hort. Sci. Proc., 33 (1936), pp. 421-425*).—Stating that the Golden Muscat, introduced by the New York State Experiment Station in 1927 and possessing a distinctive muscat flavor, is very late in ripening, the author presents the results secured with various crosses in which Muscat Hamburg figured in the parentage. Of 197 seedlings which have reached the fruiting stage, 80 possessed the muscat flavor. A total of 24 were propagated, one of which is Golden Muscat. It is suggested that several hardy muscat varieties will be available in the near future.

Fruit-bud and flower formation in the Sultanina grape, A. J. Winkler and E. M. Shemsettin (*Hilgardia [California Sta.], 10 (1937), No. 15, pp. 589-611, pls. 5*).—Studies of buds collected at different times throughout the year from vines growing in the station vineyard showed the beginning of cluster primordia formation during the first week of June. Appearing as a blunt, rather broad outgrowth of the growing point of the bud, the cluster primordium was readily distinguished from the leaf primordium which was characteristically pointed.

Observations on the fruitfulness of the buds of canes from the basal to the twentieth showed the region between the fourth and twelfth to be the most productive. The primordial clusters in the basal and apical buds were not as large as those in the middle of the canes. The development of the cluster primordia was rapid at first but with no perceptible increase during the dormant season. Bract formation, the first indication of the division of the primordial cluster, was discernible in from 7 to 10 days after cluster initiation. Tendril primordia formed later in the season than did cluster primordia. Flower development was regular, and the development of the parts was complete in from 6 to 7 weeks after leafing out.

Fruit bud studies.—III, The Sultana: Some relations between shoot growth, chemical composition, fruit bud formation, and yield, J. E. THOMAS and C. BARNARD (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *10* (*1937*), *No. 2, pp. 143–157, figs. 2*).—In this third contribution (E. S. R., 70, p. 780) there are discussed some of the relations between shoot growth, accumulation of starch and nitrogen, the current and succeeding crops, and fruit bud formation in the Sultana grape. In vineyards of subaverage to average vigor the more vegetative vines tended to be more productive, whereas in vineyards of vigorous growth no significant correlation was observed between vigor and yield of individual vines. Bud fertility was significantly and positively associated with diameter and weight but not with mean internode length of the canes. A close correlation was noted between the percentage of starch in the annual wood and fruit bud formation. The presence of a heavy crop was one of the most important factors depressing shoot growth, starch accumulation, and fruit bud formation.

The future of bud selection, R. E. CARYL (*Calif. Citrogr.*, *22* (*1937*), *No. 7, pp. 289, 328–330, figs. 3*).—Stating that there are a great many strains and variations of oranges, grapefruit, and lemons growing at the Citrus Experiment Station, the author suggests a general survey of the bud selection situation in citrus, pointing out that selection has a very important function in the development of vigorous productive trees yielding high-quality fruit. Such characters as thorns may be eliminated, minor variations removed, and the quality generally improved.

Frost injury to bearing orange trees, A. D. SHAMEL (*Calif. Citrogr.*, *22* (*1937*), *No. 7, pp. 290, 307, figs. 2*).—Following the disastrous freeze of 1913 and the less severe one of 1922, the author observed that the immediate pruning of orange trees or that performed shortly afterwards actually was detrimental to recovery and retarded a return to fruiting condition by one or more seasons. Whitewashing the exposed bark delayed the development of adventitious buds a week or so, but was distinctly helpful in reducing sunburn. An early application of reasonable amounts of nitrogen was evidently helpful in recovery. No benefit was seen from binding injured trunks or main limbs unless done immediately after the injury.

Nitrogen fertilization and root aeration, A. R. C. HAAS (*Calif. Citrogr.*, *22* (*1937*), *No. 7, pp. 286, 332, 333, figs. 3*).—At the Citrus Experiment Station, Riverside, Calif., rooted leafy-twig cuttings of lemon planted January 29 in soil the nitrogen fertilizer for which was supplied from various sources made the quickest and best growth with sulfate of ammonia. In solution cultures, lemons grown with potassium nitrate or calcium nitrate were very tardy in making a new top growth as compared with plants receiving other forms of nitrogen, such as magnesium or sodium nitrate. Nitrate nitrogen when combined with a suitable base gave excellent results. When nitrate became deficient in a culture solution, the roots became gelatinous and dark in color

and gave off a strong odor of decomposition. The addition of calcium without aeration resulted in a few days in the renewal of root deve[
The author suggests that the nitrate may be able to supply oxygen for the healthy development of the roots. In the presence of continual aeration, the lack of nitrogen did not result in breakdown or bad odor.

Cold storage tests of grapefruit and oranges, J. F. WOOD, W. H. FRIEND, and G. H. GODFREY (*Tex. Farming and Citric., 14 (1937), No. 2, p. 7*).—Comparisons made by the Texas Experiment Station of 34° and 44° F. for the storage of citrus fruit indicated that with the grapefruit the higher temperature is somewhat preferable, but the results were not favorable at either point. The Marsh grapefruit held up better at 34° than did the Little River. Of different washes used on the Foster Pink grapefruit, a soap wash gave the best results. Valencia oranges stored at 34° and 44° kept 100 percent and 99+ percent sound, respectively, from March 18 to May 10, and treatment with the various washes had no marked effect. Aluminum foil and cellophane wraps kept oranges in perfect condition, as compared with about 90 percent sound with the controls. The lining of boxes with wrapping paper of various kinds improved the keeping of Valencia oranges.

Morphology of the flower and fruit of the loquat, R. M. SMOCK (*Hilgardia [California Sta.], 10 (1937), No. 15, pp. 613–632, pls. 4, figs. 5*).—The examination of buds, flowers, and fruits collected at Davis at weekly intervals during the season from a tree of the Advance variety showed an extended period of flower bud differentiation and of flowering. The first discernible sign of flower-bud differentiation was a distinct, blunt protuberance. In the development of the macrogametophyte, the macrospore mother cell underwent heterotypic and then homeotypic division, resulting in the formation of a tetrad of macrospores. The loquat possessed 10 ovules, but only one or occasionally two seeds developed in each fruit despite the fact that apparently normal macrogametophytes were formed in all ovules.

Vascular anatomy resembled that of the apple with certain characteristic differences, e. g., the region of anastomosis in the stele of the pedicel was less extended than in the apple. The fruits had a hood or cap of toral tissue enclosing the distal portion of the ovary. The functional seed or seeds were fertile and occupied the whole central region of the fruit. The development of the seeds resulted in a marked distortion of the carpel walls and a complete disintegration of the nonfunctional ovules and the carpels in which they were located.

Differences in heterosis of walnut hybrids, C. E. SCHUSTER (*Jour. Heredity, 28 (1937), No. 6, pp. 216, 217*).—Observations on two populations of hybrid walnuts, both with the same mother parent, the Franquette variety of *Juglans regia* L., but one with Stabler as pollen parent and the other with a tree of *J. nigra*, showed material differences in growth. The Franquette × Stabler seedlings were vigorous, while those of the other lot were weak. In 1936 the Franquette × Stabler seedlings made a foot or more of new growth before the others had even opened their buds.

Flowering crab-apples, G. P. VAN ESELTINE (*Penn. Univ., Morris Arboretum Bul., 1 (1937), No. 8, pp. 103–105*).—Information is presented as to methods of producing hybrids, general culture, and the value of existing species and varieties.

FORESTRY

Studies in tolerance of New England forest trees.—XIII, The effect of root development on height and diameter growth, G. P. BURNS (*Vermont

Sta. Bul. 422 (1937), pp. 29, figs. 10).—In continuation of this series (E. S. R., 73, p. 788), trees developed from seed taken from a single cone of cypress, *Taxodium distichum*, were grown in the greenhouse in three different soil environments representing pond, swamp, and land conditions. At the end of 3 yr. the trees were cut, and striking differences were observed in height, trunk diameters, root and branch development, and foliage. On an oven-dry basis the pond, swamp, and land trees weighed 908.6, 370.3, and 152.5 g, respectively. The roots weighed 278.5, 208.3, and 80.1 g, respectively. There were no fibrous roots on the land tree. Specific gravity determinations of the wood in the basal sections of the trunks gave 0.306, 0.383, and 0.581 for the pond, swamp, and land trees, respectively. The greatest difference in increment of trunk occurred in the third year following the development of adventitious roots on the pond tree. Annual rings were more pronounced and regular in the land tree. Measurements of the cells in the basal sections of the trunks showed the land tree to have cells with the smallest radial diameters, the pond tree the largest, and the swamp tree intermediate. The root system of the pond tree was approximately three times as efficient in the production of dry weight as were those of the other two trees. The leaves of the swamp tree were most efficient both in volume and dry weight production, suggesting that the pond tree, despite its larger root system, was not able to absorb enough minerals to permit the tree to use effectively the carbohydrates produced. The author concludes that any attempt to evaluate the effect of site on the amount of increment produced by forest trees during a definite period must be based upon a physiological summation of all the site factors.

Relation of size of deciduous nursery stock to field survival in the Great Plains, J. H. Stoeckeler (*Jour. Forestry, 35 (1937), No. 8, pp. 773–777, figs. 4*).—Tests conducted in the winter of 1935–36 near Mangum, Okla., with 1-year-old seedlings of 14 species, all taken from nurseries in the west-central part of the State, showed that relatively large planting stock survives best. Stock with a caliper of 6/32 to 12/32 in. at 2 in. above the soil is considered best for windbreak planting in the Great Plains area when both survival and the cost of planting are considered. Nursery-grown stock usually gave better survival than did seedlings obtained along the streams. Grading standards required modification according to the growing habit of the species.

Commercial planting on redwood cut-over lands, H. L. Person (*U. S. Dept. Agr. Circ. 434 (1937), pp. 40, figs. 15*).—Following the virtual collapse of a large commercial redwood planting project in Humboldt and Mendocino Counties, Calif., a study was made of survival, possible causes of success and failure of plantings, etc. The commercial project continued over the years 1922–32, during which time there were planted by 10 companies over 12,000,000 trees on 26,400 acres at an approximate cost of $234,000. Redwood was the principal species planted, with Douglas fir, Port Orford cedar, and Sitka spruce making up the balance. Based on observations on established sample plats, there were found survivals of 32 percent and 41 percent in Humboldt and Mendocino Counties, respectively. Port Orford cedar and 2-yr. redwood transplants showed up to the best advantage. Survival on steep southerly exposures was particularly poor. Height growth was generally poor, with 6-yr. planted trees averaging barely 3 ft.

The time elapsing between logging and planting was found of major importance, and plants set within 1 yr. after logging showed more than twice the survival of those planted 2 yr. or more later. Less rodent damage on the newly logged areas was apparently the major factor in this difference. In conclusion, it is suggested that fairly successful planting is possible at moderate cost if

newly logged areas are promptly planted with sturdy stock. It is believed that the poor height growth and poor survival record may have been due in a considerable part to site deterioration resulting from heavy postlogging fires and subsequent erosion.

Storage and dewinging of American elm seed, E. J. George (*Jour. Forestry, 35 (1937), No. 8, pp. 769–772*).—Thoroughly ripened and dried seeds were kept successfully over a 1-yr. period when stored either in the open or in closed containers. The temperature range during the year was from 115° to −28° F. The seed was successfully dewinged to permit machine sowing. Storage for a year permitted planting elm seed in the spring when the soil was moist and conditions were favorable, and spring planting resulted in the growing of suitable-sized stock in a single season.

Root studies of important range plants of the Boise River watershed, L. E. Spence (*Jour. Forestry, 35 (1937), No. 8, pp. 747–754, fig. 1*).—Because of the serious range erosion situation, a study was made of the root systems of the principal herbaceous plants of an important range watershed area on the Boise River. The roots of 500 species were divided into four classes—(1) fibrous, (2) semifibrous, (3) semitaproot, and (4) taproot. The results indicated that the erosion problem on the area in question was largely the result of replacement of fibrous rooted species by those of the taproot and semitaproot classes. The surface soil or virgin range land was filled with a dense mass of roots which effectively controlled erosion.

Harvesting and marketing timber in New York, R. J. Hoyle (*N. Y. State Col. Forestry, Syracuse Univ., Bul., 9 (1936), No. 2–a, pp. 186, figs. 59*).—This is a general discussion on the harvesting of trees and forests and the preparation of the rough products into form for use in further manufacture.

A board foot volume table for eastern red cedar, W. Maughan (*Jour. Forestry, 35 (1937), No. 8, pp. 734, 735*).—Supplementing the data used in preparing a volume table (E. S. R., 76, p. 45) with additional measurements, there is now presented a board foot volume table for the red cedar.

Tree-fork and steel tape for close measurement of small diameters, W. H. Cummings (*Jour. Forestry, 35 (1937), No. 7, pp. 654–660, figs. 3*).—The author describes a modified steel tape and tree-fork developed for the rapid, close diameter measurement of stems between 0.02 and 10 in. For stems larger than 10 in. the tape vernier readings are, in general, of no significance.

The technique of duff hygrometer calibration, T. Kachin and H. T. Gisborne (*Jour. Forestry, 35 (1937), No. 8, pp. 736–743, figs. 2*).—Discussing the use of the hygrometer and the necessity for accuracy, the authors present information on the technic of calibration.

Fire Control Notes, August 9, 1937 (*U. S. Dept. Agr., Forest Serv., Fire Control Notes, [No. 5] (1937), pp. 229–304, figs. 13.*)—*In the usual manner* (E. S. R., 77, p. 492), brief papers are presented on various phases of fire control and fire prevention activities.

DISEASES OF PLANTS

Introduction to research on plant diseases: A guide to the principles and practice for studying various plant-disease problems, A. J. and R. S. Riker (*[Madison, Wis.]: Authors, 1936, pp. [1]+III+117, figs. 19*).—"This collection of methods has been prepared primarily as an introduction to research for the use of students interested in plant diseases." Following a section on preliminary considerations, the subject matter is considered under the following chapter headings: Foundation of a research problem; general laboratory

equipment; culture media; certain physical-chemical measurements; isolation, culture, and inoculation; virus diseases; certain procedures for pathological histology; epidemiology, environment, and control; statistical analyses; records and manuscripts; and laboratory exercise topics.

Literature references are given at the end of chapters. Eight tables and an index are included.

Phytopathogenic bacteria: Bacteria causing diseases of plants, G. K. Burgvits (*Fitopatogennyc bakterii: Bakterii vozbuditeli boleznei rastenii. Leningrad: Akad. Nauk. S. S. S. R., 1935, pp. 252*).—This is a manual of phytopathogenic bacteria covering 10 species of *Bacillus* and 174 of *Bacterium*, with their synonymy and including many new combinations to conform with the nomenclatorial system used by the author. Alphebetical indexes of the bacterial parasites and hosts and an index of the hosts (with a list of bacterial parasites for each) by their systematic groupings are provided.

A staining and maceration method of tracing the path of the vascular bundles in herbaceous plants, and its application in observations on the distribution of *Bacterium solanacearum* in relation to epinastic curvatures in petioles of tomato and potato plants, B. J. Grieve (*Roy. Soc. Victoria, Proc., n. ser., 49 (1936), No. 1, pp. 72–75, pl. 1*).—The stems are severed at the base and the plants held in 1 percent solutions of eosin or basic fuchsin until the dye has reached the topmost leaves (1–2 hr.). The epidermis is then slit along the stems and petiole bases and the plants are immersed in 15 percent nitric acid previously raised to the boiling point until sufficiently flaccid for dissection (a few seconds to 5 min.), washed in running water for 10 min., and allowed to stand in water overnight. The epidermal and cortical tissues are then dissected away with fine pointed forceps, whereupon the red dyes afford a visual and photographic color contrast with the bacterially filled vascular bundles. The method proved especially useful in anatomical work on herbaceous plants, in large measure obviating the laborious serial sanctioning method.

Serological reactions for the determination of bacterial plant pathogens, W. H. Burkholder (*Phytopathology, 27 (1937), No. 4, pp. 572–574*).—Based on a critical discussion and review of work in this field, it is concluded in this contribution by Cornell University that until careful and extensive work has been conducted on the serology of the bacterial plant pathogens too much emphasis should not be placed on individual reactions.

The distribution of Fusaria in nature, H. W. Wollenweber and O. A. Reinking (*Die Verbreitung der Fusarien in der Natur. Berlin: R. Friedländer & Son, 1935, pp. 80, figs. 41*).—This monograph includes lists of the Fusaria and related ascus forms, with references to the illustrations of these fungi in "Fusaria autographica delineata"; the Fusaria arranged according to taxonomic groups and subgroups, with their related ascus forms; the occurrence of Fusaria on plants (including fungi), animal organisms, and crude materials and products of plant and animal origin, and in the soil, air, and water; host plants, with the *Fusarium* species reported on each; Fusaria reported on blue-green and green algae, lichens, and mosses; the *Fusarium* flora of other fungi; and other fungus genera which frequently have been confused with *Fusarium*, together with illustrations of conidia of 12 such genera.

A simple and rapid method for identifying plant viruses in the field, K. S. Chester (*Phytopathology, 27 (1937), No. 6, pp. 722–727, fig. 1*).—A method is described whereby fresh, green leaf juice may be tested for the presence of virus by mixing it with serum in the field. The reaction appears to be an agglutination of the suspended plastids in the juice. A given virus juice will

react only with the type of serum specific for that virus. The method is inexpensive and very little equipment is required. On the average, the reactions appear in 10–20 min. The method has proved successful with six viruses of tobacco and appears to be somewhat more sensitive than the customary laboratory technics for serological identification of viruses.

The intracellular crystallization of Stanley's tobacco virus proteins, H. P. Beale (*Jour. Bact., 33 (1937), No. 3, pp. 336, 337*).—An abstract.

Insect transmission of virus diseases of plants, M. T. Cook (*Sci. Mo., 44 (1937), No. 2, pp. 174–177*).—This general review is a contribution from the Puerto Rico Experiment Station.

The need of permanent reference collections of insect vectors of plant diseases, F. F. Smith (*Phytopathology, 27 (1937), No. 2, pp. 198–202*).—In some cases viruses are most readily identified by their vectors. Closely related insect species are also known to transmit entirely different viruses, and reference is made to several cases regarding confusion in the identity of a given vector and its effects on the results of studies of the diseases concerned. Because of the lack of agreement relative to the specificity of certain known insects and because new species are not always readily differentiated by descriptive literature alone, it is suggested that representatives of bona fide insect vectors of plant viruses be permanently preserved in designated institutions.

Uniformity and stability of mycological nomenclature, C. L. Shear (*Mycologia, 28 (1936), No. 4, pp. 337–346*).—This is a historical account, a discussion of the difficulties and principles involved, and a presentation of certain practical suggestions relative to fungus nomenclature.

The scientific principles of plant protection, with special reference to chemical control, H. Martin (*London: Edward Arnold & Co., 1936, 2. ed., pp. XII+379*).—The first edition has been previously noted (E. S. R., 68, p. 626). In this edition "the inclusion of new material has necessitated a drastic revision, and, except for the introductory chapter, the book has been rewritten."

Recent developments in fungicides: Spray materials, J. W. Roberts (*Bot. Rev., 2 (1936), No. 12, pp. 586–600*).—This is a general discussion of the sulfur, copper, and other types of fungicides and of additives used to improve spreading and sticking qualities. One hundred and two references are cited.

Progress in plant pathology: Control of disease by resistant varieties, G. H. Coons (*Phytopathology, 27 (1937), No. 5, pp. 622–632, fig. 1*).—Disease-resistant varieties are estimated to occupy approximately one-quarter of the area devoted to 17 leading crop plants and to contribute from 60 to 70 million dollars annually to farm values. The principles underlying disease-resistance breeding and the nature of disease resistance are briefly outlined.

Recent fluctuations in plant diseases in the United States, N. E. Stevens and J. I. Wood (*Bot. Rev., 3 (1937), No. 6, pp. 277–306, figs. 18*).—"It is the purpose of the present review [including 17 literature references] to bring together the available information regarding the extent of the fluctuations of certain diseases in the United States prior to 1936." The following subjects are considered: Crop loss estimates compiled by the Plant Disease Survey, tobacco downy mildew, bacterial wilt of corn and the losses suffered by sweet corn, losses due to corn ear rots, losses from stem rust of wheat, storage rots of sweetpotato, peach brown rot, apple scab, sugar beet curly top, losses from cranberry fruit rots and what is meant by "good" keeping quality, and attempts to appraise the economic effects of fluctuations in plant diseases.

The Plant Disease Reporter, August 1 and August 15, 1937 (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 21 (1937), Nos. 14, pp. 259–280,*

figs. 10; 15, pp. 281–294, figs. 2).—Among other items of current interest, these issues contain the following notes:

No. 14.—January temperatures in relation to the distribution and severity of downy mildew (*Peronospora tabacina*) of tobacco, by P. R. Miller; peach cankers, by E. M. Hildebrand and W. D. Mills; extent of *Botrytis* rot in a strawberry field following frosts and rains, by G. M. Darrow, E. B. Morrow, G. A. Meckstroth, and C. Dearing; fruit disease eradication activities (including citrus canker and peach mosaic disease); additional breeding areas of beet leafhopper found in Texas; potato disease survey in Oklahoma, by T. B. Gordon; losses from potato diseases in northern Florida, 1932–37, by A. H. Eddins; additional notes on downy mildew (*Peronospora destructor*) and other diseases of onion in New York; wheat stem rust in Minnesota and North and South Dakota, by E. C. Stakman; plant diseases reported in Ohio, by A. L. Pierstorff; white pine blister rust (including data on its spread, pine-infection surveys, and phenological data); Dutch elm disease eradication notes; and diseases of trees observed this year in New Jersey, by R. P. White.

No. 15.—Two fungus diseases (*Fusarium conglutinans* and *Verticillium alboatrum*) of vegetables new to Florida, by G. F. Weber; vegetable diseases in northern Ohio in 1937, by J. D. Wilson; downy mildew and blast of onion in Massachusetts and New York, by O. C. Boyd and A. G. Newhall, respectively; miscellaneous notes on vegetable diseases in Massachusetts, by O. C. Boyd; reports on fruit diseases, including apple scab (*Venturia inaequalis*) in Massachusetts and in New York, and strawberry dwarf in Massachusetts; downy mildew and other diseases of tobacco in Massachusetts, by O. C. Boyd; bacterial diseases of tobacco in Canada, by L. H. Koch; leaf blister (*Taphrina coerulescens*) or curl of oak, by O. P. Owens; and Dutch elm disease eradication notes.

Plant pathology (*Idaho Sta. Bul. 221 (1937), pp. 8, 38–42, 48, figs. 2*).—Progress reports are included on tests of mosaic-resistant beans for resistance to curly top disease; new small red beans resistant to diseases; Norida, a new small white bean, developed; Idaho Refugee proves to be of good canning and freezing quality; mosaic diseases and *Fusarium* wilts of peas; potato seedling tests for virus disease resistance; and fruit disease investigations initiated, all reported by C. W. Hungerford. J. Toevs reports the results of seed treatments for control of spring wheat bunt, and H. P. Magnuson on the control of chlorosis in apples and grapes.

[**Plant disease work by the Kentucky Station**] (*Kentucky Sta. Rpt. 1936, pt. 1, pp. 27–33, 35, 36, 47*).—Progress reports are given on two new stalk diseases of tobacco (*Rhizoctonia* and a bacterial phloem necrosis), tobacco black shank, blue mold, mosaic (including overwintering in diseased roots, stalks, and leaves, and thermal and trisodium phosphate inactivation of the virus), root rot resistant varieties of tobacco, *Fusarium* wilt of White Burley tobacco, overwintering of bacterial leaf spots of tobacco, nature of the toxin of *Bacterium tabacum* [=*Phytomonas tabaci*], variations in pathogenicity of *B. tabacum* and *B. angulatum* [=*P. angulata*], bordeaux spray tests against these two pathogens of tobacco, the relation of soil productivity and diseases to red clover failure, and the status of phony peach.

[**Plant disease work by the Massachusetts Station**] (*Massachusetts Sta. Bul. 339 (1937), pp. 14–18, 25–31, 32*).—Progress reports are given on black root rot of tobacco, by C. V. Kightlinger; control of greenhouse tomato diseases, by E. F. Guba; causes and control of decay of winter squash in storage, by Guba and C. J. Gilgut; vegetable seed treatments, tests of fungicides on field tomatoes, *Verticillium* wilt of eggplant, spraying greenhouse cucumbers

for control of powdery mildew, and trials of so-called rust-resistant beans, all by Gilgut and Guba; carnation blight, *Alternaria dianthi*, by Guba; diseases of herbaceous ornamental plants caused by soil-infesting fungi, and damping-off and growth of seedlings and cuttings of woody plants as affected by soil treatments and modifications in environment, both by W. L. Doran; elm diseases in Massachusetts, by M. A. McKenzie and A. V. Osmun; Selocide spray as a plant stimulant, by P. F. Bobula and L. H. Jones; and the effect of soil temperature on a chlorosis of gardenia, by Jones.

[Plant disease work by the Puerto Rico College Station] (*Puerto Rico Col. Sta. Rpt. 1935, pp. 22–40*).—Under the annual report of the plant pathologist for the fiscal year 1934–35, M. T. Cook summarizes the work of the division, including progress reports on root diseases of sugarcane, mosaic diseases, and rind disease of sugarcane; breeding for resistance to diseases (including tomato wilt and bacterial wilt of eggplant), by A. Roque; and plant disease survey data relative to various specific crop plants.

Under the annual report of the assistant phytopathologist, Roque gives progress reports on studies of tomato wilt disease due to *Bacillus solanacearum* [=*Phytomonas solanacearum*], tobacco mosaic, cucumber mildew control, control of bacterial wilt of eggplants due to *B. solanacearum*, diseases of minor crops, *Alternaria* spot of cotton, yam wilt associated with a *Fusarium*, fruit rot of cucumbers due to *Pythium aphanidermatum*, black tip of bananas (plantains) due to *Helminthosporium torulosum*, onion blight and pink root, avocado wilt associated with a *Fusarium*, and eggplant fruit rot associated with a *Pythium*.

[Plant disease work by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1936], pp. 28, 29, 31, 32*).—Progress reports are given on spray injury to tomatoes, and on turf disease control (including brown patch, dollar spot, and pink patch).

Gall formation in host plants following haustorial invasion by Cuscuta, H. L. DEAN (*Amer. Jour. Bot., 24 (1937), No. 3, pp. 167–173, figs. 23*).—The author describes gall formation induced in nature and experimentally on 28 species of plants by 5 species and 1 variety of *Cuscuta*.

Spore formation and discharge in Fomes fomentarius, H. MEYER (*Phytopathology, 26 (1936), No. 12, pp. 1155, 1156*).—Data are presented on the duration of spore discharge (about 1 mo.) and on the total weight and number (approximately 7,563,493,150) discharged from the fruiting body under laboratory conditions. Culture and germination tests are briefly noted.

The persistence of Hypholoma incertum about tree stumps, F. C. STEWART (*Mycologia, 28 (1936), No. 5, pp. 445–450*).—This is a contribution by the New York State Experiment Station.

Comparative studies on cultures of Phytomonas lactucae-scariolae n. sp. and Phytomonas pruni, H. H. THORNBERRY and H. W. ANDERSON (*Phytopathology, 27 (1937), No. 1, pp. 109, 110*).—*P. lactucae-scariolae* is the name proposed for an organism pathogenic to leaf tissues of wild lettuce (*Lactuca scariola*), but which is nonpathogenic to cultivated lettuce and the foliage or green shoots of peach. Its morphological and cultural characteristics, as given in the technical description, are indistinguishable from *P. pruni*.

Antagonistic action of Trichoderma on Actinomyces scabies and Rhizoctonia solani, R. H. DAINES (*Amer. Potato Jour., 14 (1937), No. 3, pp. 85–93*).—*T. lignorum* was found in this study from the New Jersey Experiment Stations to produce a diffusible principle toxic to *A. scabies*, as well as to *R. solani*. However, due to the fact that this principle is rapidly destroyed by aeration at the pH of potato soils and is removed from solution by charcoal and

destroyed or removed from solution by the soil itself, it appears doubtful that this fungus will prove of much assistance in controlling potato scab. A soil bacterium was also found which produces a substance toxic to both *Trichoderma* and *Actinomyces*. "Organisms which show a similar inhibiting action to these organisms in artificial media are probably numerous. However, in such complex physical, chemical, and biological environments as are afforded by soils these antagonistic relationships may be modified or even entirely destroyed."

A comparison of the effects of tellurium and selenium on plants and animals, A. L. MARTIN (*Amer. Jour. Bot.*, *24* (*1937*), *No. 4*, *pp. 198–203*, *figs. 3*).—The toxicity of tellurium to wheat plants was found proportional to the concentration added as potassium tellurite to culture solutions. Low concentrations reduced growth and induced a yellow-white mottling of the leaves, while higher concentrations caused complete drying of the leaves and reduction in size of the secondary roots. Still higher concentrations prevented the unrolling of the leaves and the formation of secondary roots. Selenium was more toxic than equivalent concentrations (in parts per million) of tellurium, the most conspicuous symptom of poisoning being a "snow-white" chlorosis of the leaves.

No antagonism between tellurium and sulfur was shown. Addition of sulfur to various tellurium culture solutions increased the injury to wheat, while its addition to low concentrations of selenium in culture solutions reduced it.

Except for stunting, no injury to rats could be detected when their diet contained ground stems, leaves, and seeds of buckwheat grown on soil to which 32 p. p. m. of tellurium had been added. Early death resulted from similar tests with selenium.

Preliminary investigations on the effect of excessive soil salinity on the incidence of cereal root rots, J. E. MACHACEK (*Sci. Agr.*, *17* (*1936*), *No. 4*, *pp. 215–224*; *Fr. abs.*, *p. 224*).—Common root rot of cereals, due to *Fusarium* and *Helminthosporium* species, is reported to be widespread in Manitoba and to be intensified in soils containing considerable amounts of soluble salts. On such soils the plants remain dwarfed, the basal leaves shrivel, and tillering is reduced. Death usually occurs unless rain water carries the excess soluble salts below the region of the root crowns.

Laboratory tests have shown both these fungi capable of comparatively good growth on media containing concentrations of $MgSO_4$ sufficient to prevent seed germination in wheat and barley. Sand-culture tests and experiments with leached soil containing different amounts of $MgSO_4$ have further demonstrated the tolerance of these fungi to this salt. The study has also indicated that high concentrations of the salt retard seedling growth and increase the severity of the root rot.

Cereal rust losses in western Canada, F. J. GREANEY (*Sci. Agr.*, *16* (*1936*), *No. 11*, *pp. 608–614*; *Fr. abs.*, *p. 614*).—On the basis of controlled experiments it is estimated that during an 11-yr. period (1925–35) 10.8 percent of the possible wheat yield in Manitoba and Saskatchewan was lost annually due to stem rust. Another important source of loss from rust was the reduction in grain quality. Detailed estimates are presented.

Environmental conditions and the wasting disease of eel-grass, N. E. STEVENS (*Science*, *84* (*1936*), *No. 2169*, *pp. 87–89*, *fig. 1*).—This contribution from the University of Illinois points out that the wasting of eelgrass is not an isolated phenomenon, but that its coincidence in time with the unprecedented northward extension of bacterial wilt of corn (correlated with weather conditions) led the author to the present study. It is noted that the three known

records of wasting disease have coincided with extreme north declination of the moon (1894, 1912, and 1930), which in turn is correlated with transgressions in the Atlantic Ocean currents known to affect fisheries. In view of these facts it is believed worth-while to study the biology of eelgrass in relation to its environment through the next decade or more, and especially during the next period of wasting, which is apparently due about 1949 or 1950.

The relation of ear rot prevalence in Illinois corn fields to ear coverage by husks, G. H. BOEWE (*Ill. Nat. Hist. Survey, Biol. Notes No. 6 (1936), pp. 19, figs. 2*).—During the 5 yr. from 1931 to 1935, 57,395 ears were examined in 257 fields in all parts of Illinois. A large proportion of ears (from 53 to 70 percent) was found incompletely covered by the husks. The amount of visible *Fusarium* ear rot ranged from 22 to 80.6 percent (average 40.7), partially exposed ears being on the average twice as often diseased as those fully covered. *Penicillium* was visible in from 2.3 to 11.5 percent of the ears, attack being consistently greater in partially exposed than in fully covered ears. The percentage of *Rhizopus* observed ranged from 1 to 6.8. The 5-year average for *Diplodia*, *Gibberella*, *Basisporium*, and *Aspergillus* ranged from 1.2 to 0.23 percent, respectively. Except in the cases of *Fusarium* and *Penicillium*, no consistent relation to ear coverage could, in general, be established.

Contribution to the knowledge of the Fusarium diseases of rye [trans. title], J. ANLIKER (*Beitr. Kryptogamenflora Schweiz, 8 (1935), No. 4, pp. [4]+115, pls. 3, figs. 23*).—This monograph on the diseases of rye due to *F. herbarum* and *F. nivale* reports the results of isolation studies, field experiments, and pot infection tests. A bibliography of 63 titles is included.

Cytological observations on sexuality and development in Tilletia tritici [trans. title], WEN-YU YEN (*Compt. Rend. Soc. Biol. [Paris], 121 (1936), No. 13, pp. 1304–1306, figs. 14*).—The author relates the anastomoses taking place among the sporidia to sexual conjugation.

A foliage yellowing and floral injury of alfalfa associated with heat and drought, F. R. JONES (*Phytopathology, 27 (1937), No. 6, pp. 729, 730*).—This cooperative contribution by the U. S. D. A. Bureau of Plant Industry and the Wisconsin Experiment Station describes the pathological conditions of alfalfa stated in the title and observed in Wisconsin in 1936 during exceptional heat and drought.

A yellowing of alfalfa due to boron deficiency, H. R. MCLARTY, J. C. WILCOX, and C. G. WOODBRIDGE (*Sci. Agr., 17 (1937), No. 8, pp. 515–517; Fr. abs., p. 517*).—A distinctive type of alfalfa yellowing common in the interior of British Columbia is described. Small applications of boric acid or borax to the soil were found to remedy the trouble, while larger dosages produced injury. The boron content of the yellowed plants was consistently lower than that of the normal green plants.

The possibility of insect transmission of alfalfa dwarf, J. L. WEIMER (*Phytopathology, 27 (1937), No. 6, pp. 697–702*).—In this study by the California Experiment Station and the U. S. D. A. Bureau of Plant Industry, the spread of dwarf from diseased to healthy alfalfa plants in the field and in experimental plats suggested the possibility of insect transmission. The fact that caged alfalfa plants growing near infected plants did not become dwarfed, while uncaged plants became affected, also pointed to insects as the agents of transmission. However, the several insect species tested failed to transmit the disease to healthy alfalfa under the experimental conditions.

Cotton root-rot and weeds in native hay meadows of central Texas, C. H. ROGERS (*Jour. Amer. Soc. Agron., 28 (1936), No. 10, pp. 820–823; abs. in Texas Sta. Circ. 79 (1937), p. 25*).—Through this investigation by the Texas

Experiment Station, "the root rot fungus *Phymatotrichum omnivorum* has repeatedly been found infecting and killing plants in undisturbed Texas Blackland prairies. Sclerotia . . . of extremely high viability were found at 1-, 2-, and 3-ft. depths in the soil in an undisturbed meadow. Of a total of 47 plant species present in the meadow, 37 were susceptible to a greater or lesser degree to the root rot fungus. Additional susceptible plants were found in nearby meadows and in other meadows in other parts of the Blackland belt.

"Meadows and pastures should be kept free of weeds, not only to starve out the root rot fungus but also to produce a hay of better quality and to secure a thorough covering of grass for better combating soil erosion."

Pythium root rot of milo, C. Elliott, L. E. Melchers, C. L. Lefebvre, and F. A. Wagner (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 11, pp. 797–834, figs. 22*).—This is a cooperative study by the U. S. D. A. Bureau of Plant Industry and the Kansas Experiment Station.

Root rot of milo, due to *P. arrhenomanes*, first attracted attention in small experimental plats in Kansas and Texas. During the past 10 yr. it has become increasingly destructive, occurring in widely separated areas in Kansas, Texas, Oklahoma, and New Mexico. Rotting of the smaller roots results in stunting and yellowing of the plants, which die without producing heads. The pathogen occurs in the soil and has not been destroyed by ordinary rotations or fallow. It may be destroyed by soil treatments with steam, formaldehyde, and acetic acid. The development of resistant strains is the only practical method for field control. Resistant selections of Dwarf Yellow milo, Beaver, Day milo, and Wheatland have been made, and they have maintained their resistance during several years' tests. They develop normally on infested soil where ordinary Dwarf Yellow milo, Beaver, Day Milo, and Wheatland are a complete loss.

Bacterial wilt and rot of potatoes, D. B. O. Savile and H. N. Racicot (*Sci. Agr., 17* (*1937*), *No. 8, pp. 518–522, pl. 1; Fr. abs., p. 522*).—This disease entity has been observed in Quebec since 1931, and it is believed to be present in other parts of eastern Canada and the United States. Affected plants usually wilt in August, and the tubers show a discoloration of the vascular ring and become completely rotted. A slow-growing bacterium, capable of reproducing the disease and of inducing a similar condition in tomatoes, was isolated but has not yet been named.

A method of making smear preparations of the organism from diseased plants in the field is outlined in the hope that it will enable early and positive diagnosis of the disease to be made.

The susceptibility of potatoes to the vein-banding virus, L. K. Jones and C. L. Vincent (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 1, pp. 69–79, figs. 5*).—Field and greenhouse tests by the Washington Experiment Station with progeny of a single virus-free Early Rose tuber, seedling clones, and 9 commercial potato varieties showed that marked variations in symptoms are induced by infection with the vein-banding virus. Tests with seedlings developed from crossing and selfing 11 varieties indicated that only the Katahdin variety transmits resistance to this virus. Chippewa, Green Mountain, Katahdin, and Russet Burbank showed some resistance as compared with the very susceptible Bliss Triumph, Early Rose, Gold Coin, Irish Cobbler, and Warba.

Studies on *Rhizoctonia solani* Kühn.—I, Effect of potato tuber treatment on stem infection six weeks after planting, G. B. Sanford (*Sci. Agr., 17* (*1936*), *No. 4, pp. 225–234; Fr. abs., p. 234*).—"The effects of treating potato tubers with mercuric chloride solution, acidified, and the transfer of *R. solani* to the stems from clean treated tubers v. untreated tubers heavily infected

with sclerotia was studied under a wide range of field conditions, which included different crop sequences, culture, and soil types. The effect, as indicated on the stems 42 days after planting, was recorded by a numerical rating for severity of lesions and also by the percentage of plants without lesions. In 24 out of a total of 34 experiments (70 percent) the severity of infection was significantly greater on the plants from untreated sets heavily infested with sclerotia than on those from clean treated sets. On the basis of percentage of plants with clean stems, in 31 experiments, or 91 percent of them, an effective treatment would have been valuable at this stage. There was a tendency for increased infection arising from apparently clean untreated sets. All soils, regardless of whether the previous crop was summer fallow, cereals, truck, or potatoes, or whether of glacial origin or the black prairie loam type, carried a basic, although variable infestation. In the 34 experiments an average of 28.7 percent of the stems of plants from sets with a heavy infestation of sclerotia had lesions attributable to the sclerotia, and if the amount for which the soil infestation was responsible is included the average was only 42 percent. Extreme variability, which could not be accounted for in the transfer of the pathogen to the stems from heavily infested sets, was common during the 3 yr. of the test. The treatment used apparently caused as many missing hills as the pathogen from the sclerotia did, which average per experiment was approximately 2.5."

Control of a wilt disease of potato by formaldehyde dust, C. F. Taylor and F. M. Blodgett (*Amer. Potato Jour., 14 (1937), No. 5, pp. 154–157*).—This contribution by Cornell University indicates that treatment with formaldehyde dust reduces the injury from this disease sufficiently to be of great importance in seed production, but that serious yield decreases may result if extreme precautions are not observed in using this method.

Disinfectants and cut-seed potatoes, B. F. Lutman (*Vermont Sta. Bul. 418 (1937), pp. 36, pls. 4, figs. 13*).—Cut potato seed, as well as desprouted whole tubers, may be seriously injured by certain disinfectants. The normal cork layer offers protection, but regenerated cork is much less effective.

Based on their action, seed-potato disinfectants are grouped into three classes—(1) formaldehyde and $HgCl_2$, so soluble in aqueous solutions as to be highly toxic to bacteria and fungi; (2) mercurous chloride (calomel) and yellow mercuric oxide, slightly water-soluble but sufficiently so to check the growth of soil parasites and forming a suspension from which the seed pieces remove much finely divided mercury salt; and (3) organic mercury compounds, readily soluble in water and applied for a brief time only, their efficiency due primarily to the salt adhering after the dip. Formaldehyde proved most injurious to cut seed, not only penetrating the exposed parenchyma but working its way along the vascular bundles and even into the sprouts. Solutions of $HgCl_2$ kill the seed pieces by coagulating the protoplasm and percolate farther into the flesh the longer the piece is kept. Immediate removal of the coagulated layer lessens the penetration, which otherwise may kill the sprouts on planted seed pieces. The proportion of calomel absorbed is so small that no injury ensues in the seed pieces, and hence the seed thus disinfected usually germinates well. Yellow oxide of mercury behaves much like calomel. The brevity of application and quick drying of organic mercurials result in a fair and prompt depth of penetration, and the residue comes into action gradually. If drying follows immediately and completely, the cut piece is undamaged. These results are based on 5 yr. of field and greenhouse tests under both dry and wet conditions and have been substantiated by penetration studies and by chemical determinations of the amounts of mercury removed from various solutions or suspensions.

If cut tubers are to be disinfected they should be allowed to regenerate a new skin by storage for at least 5 days in a damp, cool place. Calomel, yellow oxide of mercury, or one of the organic mercurial dips should be used, preferably the latter (with prompt and thorough drying).

Chemical studies on the virus of tobacco mosaic.—VII, An improved method for the preparation of crystalline tobacco mosaic virus protein, W. M. STANLEY (*Jour. Biol. Chem., 115 (1936), No. 3, pp. 673–678*).—Continuing this series (E. S. R., 76, p. 206), "an improved method for the preparation of crystalline tobacco-mosaic virus protein, involving the use of ammonium sulfate, celite, and calcium oxide, and by means of which the yield from crude twice-precipitated globulin has been increased to about 80 percent, is described."

Tumors of tobacco hybrids, M. LEVINE (*Amer. Jour. Bot., 24 (1937), No. 5, pp. 250–256, figs. 17*).—Comparisons are made between artificially induced crown galls on *Nicotiana glauca* and *N. langsdorffii* and spontaneous tumors on crosses between these two parents when the latter is the male parent. The bacterial tumors were typical crown galls, with histioid structures consisting of a mass of parenchyma in which distorted, aberrant, bizarre fibrovascular elements were formed. The spontaneous tumors of the hybrid, closely resembling crown gall macroscopically, arose from a calluslike mass of parenchymatous tissue with cells frequently filled with starch and other bodies, presumably tannin. The stem forms were often globular and deep green in color, and the tissue mass resolved itself into organoids consisting of aberrant rudimentary stems and leaves. The peripheral portion was embryonic in nature, consisting of small cells with comparatively large nuclei. The fibrovascular elements were feebly developed and not disorganized or disconnected when seen in longitudinal median section of these organoids. Similar structures are reported on the crown of the geranium.

These spontaneous tumors are not identical with crown gall, and it is suggested that another type of growth is here concerned, having a calloid structure with differentiation of imperfectly formed stems and leaves. These may be compared to the monstrosities of teratomata among animal tumors.

Disease resistance and new seedling selection in 1936 at the U. S. Sugar Plant Field Station, Houma, La., E. V. ABBOTT, R. D. RANDS, and E. M. SUMMERS (*Sugar Bul., 15 (1937), No. 14, pp. 3–7*).—During 1936 the general and specific objectives have remained as previously reported (E. S. R., 75, p. 645), with particular attention focused on the urgent necessity of discovering a vigorous, mosaic-resistant substitute for Co. 281 and the desirability of finding more suitable disease-resistant, early-maturing varieties adapted to heavy and mixed soils. A brief summary of progress in 1936 is presented, including the study of a large number of seedlings in the field (4,119 inoculated with mosaic, 998 with the red rot fungus, and 2,318 analyzed for Brix and sucrose), on the basis of which 117 new C. P. numbers were assigned to the cane breeder (G. B. Sartoris), and seed of these varieties were distributed for testing. The performances of promising selections and seedling family tests are presented.

A nematosis of sweet potatoes caused by *Anguillulina dipsaci*, the stem or bulb nema, H. A. KREIS (*Phytopathology, 27 (1937), No. 6, pp. 667–690, figs. 6*).—During a 1930 survey of 70 localities in the sweetpotato regions of New Jersey, Maryland, Delaware, Virginia, North Carolina, and South Carolina, *A. dipsaci* was found once only on sweetpotatoes in the field but in 6 localities in storage. On this host the disease appears to be mainly a storage condition. Infested roots have a brown to brownish-black layer under the skin, while in more advanced stages the whole interior shows signs of decay.

A differential count of the nemic population of an infested root by layers yielded 501,631 specimens. Toward the center the nemas occurred mostly in nests. Males gradually disappeared toward the center, and a decrease in total numbers of nemas from the outside toward the center was rapid after the first layer.

Transmission tests were made from sweetpotato plant to plant, from sweetpotato to potato tubers, and from other hosts to sweetpotato. The only positive conclusions were that the green parts of sweetpotato plants are not normally attacked, that transfer from one sweetpotato root to another occurs by contact, that the one transfer test from potato tuber to sweetpotato root was of too short duration to allow definite commitments, and that some nemas entered cut sweetpotatoes from an inserted piece of narcissus bulb.

Of the 24 tests directed toward a satisfactory chemical control in the root, only Semesan Bel and lime combined with phenol showed promise. Eradication of weeds in the fields, crop rotation, use of uninfested seed potatoes, and general sanitary methods in handling and storing the roots are recommended as control aids.

Comparative measurements of *A. dipsaci* from sweetpotatoes and from other hosts indicated a great variability in the forms, even from the same host. Differentiation of this nema into species or subspecies on the basis of hosts is therefore not favored.

Diseases of vegetable crops, J. C. Walker (*Ann Arbor, Mich.: Edwards Bros., 1936, pp. [2]+65*).—"The purpose of this text is to bring together in outline form the important facts concerning the major diseases of the vegetable crops." The arrangement is alphabetical by common names of crop plants, under each of which the culture and diseases are discussed, with literature references.

***Plasmodiophora brassicae*, the cause of cabbage hernia**, M. S. Woronin (*Phytopath. Classics No. 4 (1934), pp. 32, pls. 7*).—With this translation of the author's early paper [1] is a biographical sketch of him by C. Chupp.

A transmissible mosaic disease of cauliflower, C. M. Tompkins (*Jour. Agr. Res. [U. S.], 55 (1937), No. 1, pp. 33–46, figs. 5*).—Through study by the California Experiment Station, it was found that this mosaic, due to a hitherto undescribed virus, occurs chiefly in the cool, coastal valleys of California, frequently causing considerable crop losses. It is characterized by stunting of the plant; vein clearing, followed by vein banding, mottling, necrotic spotting, midrib curvature, and distortion of the leaves; and dwarfing of the terminal head. The insect vectors are shown to be *Brevicoryne brassicae*, *Rhopalosiphum pseudo-brassicae*, and *Myzus persicae*. The virus is also transmissible by juice inoculations, with carborundum as an abrasive. It withstands aging in vitro for 14–15 days at 22° C., its inactivation temperature is approximately 75°, and its tolerance to dilution is about 1:2,000. The host range includes 51 vegetable varieties, 3 ornamentals, and 5 weeds, all Cruciferae.

Cantaloupe wilt is spreading in State, O. A. Reinking (*Farm Res. [New York State Sta.], 3 (1937)], No. 4, pp. 10, figs. 2*).—The *Fusarium* wilt is reported as spreading and becoming increasingly destructive in the cantaloup regions of the State, with total losses on thoroughly infected soils. The disease was first reported in the State in 1930 by C. Chupp. The symptoms are described. The fungus was shown to be present throughout the entire infected plant, and inoculations with various isolates readily resulted in infection, the organism exhibiting extreme virulence under optimum conditions for

[1] Jahrb. Wiss. Bot., 11 (1878), pp. 548–574, pls. 6.

disease production and 100 percent of the susceptible varieties tested (and named) succumbing in inoculated soil. The disease is evidently identical with the one reported from Minnesota (E. S. R., 69, p. 669). *Fusarium* wilt was demonstrated to be seed borne and the fungus to remain infective in the soil for at least 2 yr.

The planting of seed from healthy plants, avoidance of infected soil, and the ultimate development of resistant varieties constitute the control measures recommended. "The demonstration of resistance within the edible varieties of cantaloups shows that it should be possible to obtain a commercial resistant type that will meet the needs of New York growers."

Phytophthora rot of Honeydew melon, C. M. Tompkins and C. M. Tucker (*Jour. Agr. Res.* [*U. S.*], *54* (*1937*), *No. 12, pp. 933–944, figs. 4*).—This rot was found in part of a commercial planting near Modesto, Calif., where the soil had become waterlogged from poor drainage. It affects both immature (green) and mature (ripe) fruits, but not the vines, symptoms consisting of small, incipient brown or water-soaked spots which enlarge to form water-soaked lesions. Occasionally infected fruits develop zonate lesions. The invaded tissues are soft, water-soaked, and odorless.

In this joint contribution by the California and Missouri Experiment Stations, the causal organism was identified as *P. capsici*, infection with which was obtained by placing inoculum on the unbroken fruit surfaces and covering with moist absorbent cotton under an inverted preparation dish. The incubation period varied from 4 days for immature to 6 days for mature fruits. Excessive irrigation, poor drainage, and high temperatures were found to be the chief predisposing factors. Negative results were obtained in seed-transmission tests. In addition to Honey Dew melon, the fungus proved pathogenic to 14 species of 11 genera belonging to 6 families. Avoidance of the disease involves good soil drainage and careful irrigation practices.

Infection of Honey Dew melons by *P. drechsleri* was also demonstrated, but this fungus spread less rapidly through the tissues, which remained firm.

***Cytological studies on the parasitic relationship of Urocystis cepulae to* Allium fistulosum,** R. I. Evans (*Amer. Jour. Bot.*, *24* (*1937*), *No. 4, pp. 214–218, figs. 17*).—As a result of this study by the University of Wisconsin it was found that *A. fistulosum* seedlings ultimately producing smut-free plants are consistently and successfully parasitized by the onion smut fungus in the upper parts of the cotyledons, while at least the lower halves are consistently free from infection. Little difference in incidence and severity was observed at soil temperatures of 10°–26° C. Healthy mycelium may develop in the upper part of the cotyledon, the result being abundant chlamydospore formation. When penetration of the lower part of the cotyledon is accomplished there is (1) almost immediate complete inhibition of the fungus, (2) partial inhibition followed shortly by disorganization, or (3) establishment of the fungus in the deeper host tissues before its ultimate disorganization. The defense mechanism of the cells in the lower part of the cotyledon appears comparable to that of onion seedlings in the transition stages leading from susceptibility to resistance.

A. fistulosum seedlings possess a considerable resistance to damping-off as compared with onion seedlings of like age.

Common mosaic of the garden pea, Pisum sativum, D. M. Murphy and W. H. Pierce (*Phytopathology*, *27* (*1937*), *No. 6, pp. 710–721, figs. 2*).—The symptoms induced by pea virus 3 on garden peas are characterized by variations ranging from severe yellow mottling and dwarfing to less intense mottling and a general chlorosis. The host-range tests in this study by the Idaho Experiment

Station included 2,424 annual and perennial plants representing 32 families, 60 genera, and 94 species. Infection was noted in only 1 family (Leguminosae). Species of *Medicago*, *Melilotus*, and *Trifolium* were found infected, and certain plants of these species may be possible overwintering hosts. The 62 garden-pea varieties tested were found to vary in resistance and susceptibility, as were also the field-pea varieties tested. Of a total of 4,263 seedling garden-pea plants grown under controlled conditions from seed collected from diseased plants, none gave evidence of seed transmission. The virus was inactivated by heating at 60° C. for 10 min. and by aging in vitro for 3 days at 22°.

It is concluded that the data presented on symptom expression by differential hosts, host range, modes of transmission, and physical properties of the common pea-mosaic virus (pea virus 3) are sufficient to differentiate it from other legume viruses.

The Riverside tomato: A new variety resistant to two wilt diseases, J. W. Lesley and M. Shapovalov (*Seed World, 41 (1937), No. 7, pp. 8, 9, figs. 3*).—The Riverside tomato variety, developed cooperatively by the California Citrus Experiment Station and the U. S. Department of Agriculture, is described and illustrated. It is reported to be suitable for both fresh consumption and canning and to be resistant to both *Fusarium* and *Verticillium* wilt diseases.

Rosette or little leaf of fruit trees, H. E. Thomas (*Phytopathology, 27 (1937), No. 6, pp. 727–729*).—This contribution by the University of California is a critique of the published work of Kozlowski (E. S. R., 77, p. 61) on the etiology of this disease. It is stated that "one of the most consistent facts that has emerged from this complex problem is that of complete recovery of affected trees treated by the introduction of zinc, in any one of several forms, into the trunks or main branches."

Zinc sulphate treatments for "little leaf" condition of deciduous fruits, O. T. McWhorter (*Oreg. State Hort. Soc. Ann. Rpt., 28 (1936), pp. 121–124*).—This contribution from the Oregon State College presents a summary of successful trials of zinc-containing sprays, dusts, and injections, and metallic zinc in controlling little leaf on sweet cherry, apricot, prune, and apple.

Apple scab spray service for 1936, R. C. Baines (*Ind. Hort. Soc. Trans., 1935, pp. 71, 72*).—This is a contribution from the Indiana Experiment Station.

Spray materials and the control of apple scab and cedar rust, J. M. Hamilton (*Amer. Pomol. Soc. Proc., 51 (1935), pp. 194–199*).—This contribution by the New York State Experiment Station comprises a general discussion based on experiments in the Hudson Valley.

The "transitional apple spray period", F. W. Hofmann (*Va. Fruit, 25 (1937), No. 5, pp. 20–22*).—From tests by the Virginia Experiment Station it was found that excellent results in disease control with reduction in spray injuries may be obtained by various wettable sulfurs, flotation sulfur, monocalcium sulfide, etc., and also by their admixture with lime-sulfur or bordeaux sprays, if the apple trees have been thoroughly treated before the transitional period (the 2.5–3 weeks following petal fall) or when scab has already been materially reduced, or, perhaps, in lighter scab seasons. Under other conditions these less effective materials cannot be relied upon.

Spray injuries on the apple fruit, A. B. Groves (*Va. Fruit, 24 (1936), No. 9, pp. 16–22, figs. 2*).—This contribution by the Virginia Experiment Station gives a general account of spray injuries, including the common types (illustrated) and factors influencing them.

The control of drought spot and corky core of the apple in British Columbia, H. R. McLarty, J. C. Wilcox, and C. G. Woodbridge (*Better Fruit,*

31 (1937), No. 10, pp. 12, 13).—Following brief discussions of these troubles and the history of the investigation, it is stated that applications of boric acid and borax to the soil gave perfect control without apparent injury to the trees. Spraying also gave good results, but caused some leaf injury. Analyses of the soil showed but little difference in boron content between orchards with and without the trouble, but the less the boron content of McIntosh fruit, leaves, or twigs the worse was the disease. Soil application of boric acid or borax around the trees at the rate of 30 lb. per acre is recommended for British Columbia.

Boron treatment was also beneficial in the control of drought spot of pear and apricot and of gum spot of plum trees.

Two species of Physalospora in England, N. E. STEVENS (*Mycologia, 28 (1936), No. 4, pp. 330–336*).—The relationship of two very similar fungi found on rotten apples in England and in New York, in each case named *Sphaeropsis malorum*, has caused much controversy. This paper reports the finding in England of the ascogenous stages of both these fungi and the development of the pycnospores in pure culture from ascospores. The New York fungus is referred to *P. obtusa* and the fungus originally described from England to *P. mutila* n. comb.

Another pycnidial fungus, *Diplodia sarmentorum*, on the same hosts is discussed and its geographical distribution outlined.

Sclerotium disease on apple trees, J. S. COOLEY (*Amer. Nurseryman, 64 (1936), No. 5, p. 7, fig. 1*).—*S. rolfsii*, a fungus attacking herbaceous plants in the Southern States, is here reported as infecting apple trees in the nursery (Maryland and Tennessee).

The occurrence of aerial bacterial strands on blossoms, fruits, and shoots blighted by Erwinia amylovora, S. S. IVANOFF and G. W. KEITT (*Phytopathology, 27 (1937), No. 6, pp. 702–709, figs. 2*).—In this study by the Wisconsin Experiment Station, bacterial exudate was found in the form of hairlike strands on pear pedicels, shoots, and fruits blighted by *E. amylovora* [=*Bacillus amylovorus*]. These strands were made up of cells of the pathogen bound together by a cementing substance. They were curved, glistening, usually colorless, from less than a millimeter to several centimeters long, and 8μ–45μ thick. The strands disintegrated instantly in water and slowly in glycerin. They were infective, and could be easily broken off and disseminated by the wind.

Frosty mildew of peach, B. B. HIGGINS and F. A. WOLF (*Phytopathology, 27 (1937), No. 6, pp. 690–696, fig. 1*).—The morphology and life cycle of *Cercosporella persica*, causing frosty mildew of peach, was studied cooperatively by the Georgia Experiment Station and Duke University. It was found that, besides conidia, the fungus produces spermogonia and perithecia. The conidial stage was made the type of the genus *Cercosporella*, and it appears desirable thus to retain it and to enlarge Saccardo's concept of its generic limits. Both spermogonia and perithecia are initiated simultaneously during the fall. Spermatial production ceases after about 2 mo., while the perithecia do not mature until the following spring. The perithecial stage apparently has never been observed before, and it is accordingly given the name *Mycosphaerella persica* n. sp.

Disease-free citrus trees is aim of experiment station, H. S. FAWCETT (*Calif. Citrogr., 21 (1936), No. 10, pp. 396, 397*).—This paper is from an address summarizing progress by the California Citrus Experiment Station in control work on citrus diseases.

Chlorosis of citrus in Puerto Rico, J. H. Jensen (*Phytopathology, 27 (1937), No. 6, p. 731*).—This contribution by the Puerto Rico Experiment Station reports the beneficial effects of zinc sulfate sprays in the control of a leaf chlorosis on grapefruit. Diseased trees were found only on alkaline soils. The symptoms are briefly described.

Some new aspects of gummosis and psorosis of citrus trees in Florida, A. S. Rhoads (*Citrus Indus., 17 (1936), No. 10, pp. 6, 7, 15, 19, [23], figs. 4*).—This contribution from the Florida Experiment Station is an address summarizing the results of several years of study and observation. The results with the bark disease emphasize the need for treating pruning and other wounds with an effective and durable dressing in order to obviate many cases of gummosis and prevent the entrance of the organisms of wood decay.

Effect of mottle leaf on fruit size, J. C. Johnston (*Calif. Citrogr., 22 (1936), No. 2, pp. 86, 87, figs. 3*).—Zinc treatments (as soil, injection, and spray applications) increased the average size and decreased the range of sizes of the fruit, the effect being to reduce the amount of undesirable small and large fruit. Best results followed the spray treatments.

Endoxerosis, or internal decline, of lemon fruits, E. T. Bartholomew (*California Sta. Bul. 605 (1937), pp. 42, pl. 1, figs. 5*).—The author discusses the characteristics of endoxerosis, the varieties affected, its general distribution, comparisons with *Alternaria* rot and membranous stain, and other pertinent data. Desiccation cavities adjacent to the vascular bundles in the peel of the stylar end of the fruit were the first symptoms noted, and the development of subsequent symptoms is described in detail. About 10–15 percent of the fruit picked from May 1 to November 1 in southern California was found to be affected. Fruits growing slowly or very rapidly were more susceptible than those growing at intermediate rates. The amount of acid was reduced in proportion to the injury, but its strength was about as great as in normal fruits. Partial defoliation or enclosure of the trees in tents was followed by a decrease of the trouble. Comparatively large amounts of water were withdrawn from the fruits by the transpiring leaves, and the daily contraction of the fruit from this cause began earlier and lasted longer in the long, dry summer days than in winter and in endoxerotic as compared with normal fruits. Twigs that had borne affected fruits withdrew much less water from potometers than those which had borne normal fruits, and the amounts of gas which could be forced through the twigs were less in the first case. The gum characteristic of affected fruit appeared to be formed largely from the cell-wall components and that of the twigs largely from the cell contents. The gum-forming pentosans were much more abundant in the peel of affected fruits, and the first indication of gumming appeared in the vascular region of the peel of the stylar end, progressing from that point. Examination of 1,782 twigs showed no relation between the presence of gum in the pith and the development of endoxerosis.

In tank experiments, trees receiving the minimum amount of water developed more endoxerosis than those with the medium, and the latter slightly less than those with the maximum amounts. Also, the total amount of fruit with medium water supply was considerably greater than with minimum and slightly greater than that with maximum supply. Varietal differences in susceptibility were inconsistent. The time of first appearance depended largely on the rainfall of the previous winter, and more endoxerosis developed on the south than on the north side of the trees. The factors governing the number of developed v. undeveloped seed, variations in fertilizers, and bagging the fruit appeared to have no relation to the development of the trouble.

In general, the data indicate that daily and protracted water deficits in the tissues concerned, high temperatures during the active growing season, and the presence of substances more or less readily convertible into gum are the most important etiological factors. The strong inclination to gum production in citrus under adverse conditions was confirmed.

Various control or alleviative measures for grove and packing-house use are suggested, notably the use of a smaller picking ring during the warm months.

Notes on rust diseases of Sempervivum and other ornamentals in the New York area, B. O. Dodge and G. M. Reed (*Jour. N. Y. Bot. Gard., 37 (1936), No. 435, pp. 54–59, figs. 4*).—This paper consists of notes on rust of *S. tectorum* due to *Endophyllum sempervivi*, on rust of rhododendrons and azaleas due to *Pucciniastrum myrtilli*, and on rusts of carnation, snapdragon, chrysanthemum, and hollyhock.

Effect of heat on ability of Cicadula sexnotata (Fall.) to transmit aster yellows, L. O. Kunkel (*Amer. Jour. Bot., 24 (1937), No. 5, pp. 316–327, figs. 3*).—"Infective colonies of aster leafhoppers subjected to heat treatments lasting 1 day or longer at about 31° or 32° C. [87.8° or 89.6° F.] lost the ability to transmit yellows either permanently or temporarily. The colonies held at *these temperatures for 12 days or longer suffered permanent loss of ability* to transmit. Colonies treated from 1 to 11 days regained ability to transmit after periods varying from a few hours up to many days. The longer the colonies were heat-treated, the longer it took them to regain ability to transmit. . . . These findings are believed to indicate that long heat treatments cause inactivation of all the virus carried by infective insects, and that short heat treatments cause inactivation of a part only. The time required for insects to regain infectivity is regarded as a heat-induced incubation period during which that portion of the virus not inactivated by the treatment multiplies sufficiently to render the insects infective. The fact that heat treatments have a more marked effect on colonies in which virus is undergoing natural incubation than on infective colonies is interpreted as due to a lower concentration of virus in the latter than in the former.

"After heat treatements, viruliferous colonies of insects frequently transmitted mild strains of the aster-yellows virus. Three such strains were shown to remain unchanged on passage from plant to plant. Isolation of mild strains by this method suggests that heat exerts some kind of selective action on the viruses of mild strains.

"The rate of spread of aster yellows in a field plat was found to reach its highest point late in the season when plants were relatively resistant to infection because they were nearing maturity and when insects were less numerous than in midsummer. The heat treatment experiments suggest that midsummer temperatures may inactivate much of the virus carried by the leafhoppers at this season of the year, and that the temperature effect on virus-bearing insects may account for the late seasonal rise in rate of spread."

The perfect stage of Botrytis convoluta, F. L. Drayton (*Mycologia, 29 (1937), No. 3, pp. 305–318, figs. 9*).—Under carefully controlled conditions, combined with the use of microconidia for spermatization, the convoluted sclerotial masses of *B. convoluta* (cause of a rhizome rot of iris) developed apothecia of the *Sclerotinia* type, thus establishing the connection of this ascigerous stage *S. convoluta* n. sp. with the conidiophores and conidia of the imperfect stage *B. convoluta*.

Artificial defoliation of field-grown rose plants.—Preliminary report, G. T. Boyd and J. J. Taubenhaus (*Amer. Rose Ann., 1936, pp. 130, 131; abs. in Texas Sta. Circ. 79 (1937), pp. 23, 24*).—"Commercial defoliation of rose plants

during fall harvest is desirable to prevent numerous plant diseases from being carried over in storage on the old clinging leaves. Defoliation occurred with a spray consisting of 1 pt. commercial sulfuric acid, 2 lb. of iron sulfate, and 50 gal. of water. Only Paul's Scarlet Climber plants were used in the 1935 tests."

[The 1935 and 1936 disease-control campaigns], L. M. Massey (*Amer. Rose Ann., 1936, pp. 110–116; 1937, pp. 101–107*).—These contributions from Cornell University discuss the progress made in the rose disease-control campaign initiated in 1934, with a tabulation of the returns, including observations in 34 States.

A bothersome black-spot experience, H. R. Rosen (*Amer. Rose Ann., 1936, pp. 121–126*).—This contribution by the Arkansas Experiment Station reports the disease as of epidemic proportions in 1935. The results of small-scale spray tests were rather unsatisfactory, but several rose varieties stood up well against the disease even without fungicidal treatment.

Sunscald of tulip flowers, A. H. Graves (*Phytopathology, 27 (1937), No. 6, pp. 731–734, fig. 1*).—The injury is ascribed to sunscald, due to the facts that in some varieties the flowers were injured when exposed to the sun but remained normal in the shade and that the tissues immediately adjacent to the principal veins remained uninjured. Lists of susceptible and resistant varieties are given.

The life histories of Botryosphaeria melanops and Massaria platani, C. L. Shear and R. W. Davidson (*Mycologia, 28 (1936), No. 5, pp. 476–482, figs. 5*).—*B. melanops* was collected from red oak (*Quercus borealis*) in Connecticut and *M. platani* from a canker on a sycamore tree in Washington, D. C.

Chestnut breeding work in 1935, A. H. Graves (*Brooklyn Bot. Gard. Rec., 25 (1936), No. 2, pp. 62–75, fig. 1*).—This report covers hybridizing work and testing of various species and strains with a view to securing desirable types resistant to the chestnut blight (*Endothia parasitica*).

A new species of Dothiorella causing die-back of elm, A. F. Verrall and C. May (*Mycologia, 29 (1937), No. 3, pp. 321–324, figs. 6*).—*D. ulmi* n. sp. is described as the pycnidial form of the fungus previously reported as causing the disease commonly known as the *Cephalosporium* die-back of elm.

A report on tests of fungicides for the control of elm diseases in nurseries, J. C. Carter (*Ill. Nat. Hist. Survey, Biol. Notes No. 4 (1935), pp. [2]+7, fig. 1*).—The materials and methods are discussed, and the results are tabulated, with accompanying notes.

Current studies on the bacterial blight diseases of filberts and its control, P. W. Miller (*Oreg. State Hort. Soc. Ann. Rpt., 28 (1936), pp. 152–159*).—Filbert blight (due to *Phytomonas* sp.) is reported as very prevalent in the Pacific Northwest in 1936, its severity probably being associated with rainy weather during the critical infection period and with the unseasonably low temperatures of early November 1935, which seemed to predispose to attack. The disease was found for the first time on the fruit, but crop losses were largely indirect due to the killing of many of the pistillate flower buds, nut-bearing shoots and branches, and leaves. Two critical infection periods occur, viz, (1) in the fall and early winter and (2) in the early spring, the first being more favorable to infection. In 1936 the peak of the disease was reached in late May. Spraying with 4–4–50 bordeaux mixture during late August or early September 1935, before the first fall rains, appreciably reduced the disease incidence traceable to drip from infection sources in the trees. Spring applications appeared to result in a limited reduction in incidence.

New hosts and distribution of Rehmiellopsis bohemica, A. M. Waterman (*Phytopathology, 27 (1937), No. 6, pp. 734–736*).—The needle and twig blight

fungus of fir was reported previously on *Abies concolor* in Massachusetts, Maine, and New York. It has now been found in Rhode Island on *A. concolor* and *A. cephalonica;* in Edgewood, British Columbia, on *A. lasiocarpa;* and in Maine on *A. balsamea.* The last two species have not been reported previously as hosts. Infection occurred on small nursery trees of *A. nobilis* and *A. fraseri* planted among the most severely diseased trees in eastern Massachusetts. The former species has been reported as a host for the fungus in Denmark and Scotland only, and the latter has not been reported previously.

Two spruce-infecting rusts, Chrysomyxa piperiana and Chrysomyxa chiogenis, J. H. FAULL (*Jour. Arnold Aboretum, 17 (1936), No. 2, pp. 109–114*).—The two species and inoculations with them on *Picea* species are described.

Opuscula miscellanea nematologica, III–V, G. STEINER (*Helminthol. Soc. Wash. Proc., 3 (1936), Nos. 1, pp. 16–22, figs. 4; 2, pp. 74–80, figs. 4; 4 (1937), No. 1, pp. 33–38, figs. 5*).—Continuing this series (E. S. R., 74, p. 509), the author describes in part 3 *Rhabditis spiculigera* n. sp., associated with a strawberry root rot from Ontario; *Neocephalobus leucocephalus* n. sp., feeding on *Ceratostomella* sp., a fungus living in the scarlet oak (*Quercus coccinea*), from Virginia; and *Rhabditolaimus* (*Rhabdontolaimus*) *prodelphis* n. sp., and *Eucephalobus nannus* n. gen. and n. sp., both from diseased *Iris ochroleuca* plants from Long Island. Part 4 includes observations of nematodes in bulbs of an *Iris tingitana* hybrid, with a description of *Aphelenchoides limberi* n. sp.; a description of the *Acrobeles variabilis* n. sp. observed in diseased *Ixia* bulbs; a description of *A. bodenheimeri* n. sp., a new nematode from Palestine; observations on *Tricephalobus longicaudatus;* and remarks concerning *A. crossotus.* Part 5 describes *Tylenchorhynchus claytoni* n. sp., an apparently rare nemic parasite of tobacco; *Rotylenchus blaberus* n. sp., a nematode parasite of yams (*Dioscorea* sp.); and *Anguina spermophaga* n. sp., a seed parasite of *Saccharum spontaneum;* and presents notes on *Heterodera marioni* attacking bulbs of *Ornithogalum saundersiae.*

ECONOMIC ZOOLOGY—ENTOMOLOGY

Ecological animal geography, prepared by W. C. ALLEE and K. P. SCHMIDT (*New York: John Wiley & Sons; London: Chapman & Hall, 1937, pp. XIV+597, figs. [137]*).—Part 1 of this authorized, rewritten edition based on Tiergeographie auf oekologischer Grundlage, by R. Hesse, published in 1924, considers the ecological foundations of zoogeography (pp. 1–145); part 2 the distribution of marine animals (pp. 146–287); part 3 the distribution of animals in inland waters—a phase of limnology (pp. 288–376); and part 4 the distribution of land animals (pp. 377–556). Bibliographies accompany the chapters, of which there are 28.

Regulations relating to game, land fur animals, and birds in Alaska, 1937–38 (*U. S. Dept. Agr., Bur. Biol. Survey, Alaska Game Comn. Circ. 14 (1937), pp. 32, fig. 1*).—A compilation of these regulations applicable to the year 1937–38 (E. S. R., 75, p. 654).

The snowshoe rabbit or varying hare (Lepus americanus, L. campestris (?)) (*Alaska Sta. Bul. 5 [1936], pp. 18, 19*).—Reference is made to the cause of the periodical rise and fall in the rabbit population of Alaska, the average cycle of which in the Fairbanks area commencing with 1905 has been 10 yr.

Crow-waterfowl relationships, based on preliminary studies on Canadian breeding grounds, E. R. KALMBACH (*U. S. Dept. Agr. Circ. 433 (1937), pp. 36, pls. 3, figs. 15*).—A study inaugurated in the spring of 1934 and con-

tinued through the nesting season of that year and of 1935, conducted with a view to obtaining a current insight into the relationship of crows to waterfowl on their breeding grounds, is reported. Due to the drought conditions the studies were restricted to Canadian areas in Saskatchewan and Alberta, where ducks and crows could be found in reasonable abundance and in close association. The field studies revealed that there are areas near the northern border of agriculture in these two Provinces in which the presence of an inordinately dense crow population is a menace to duck-nesting marshes, but that where crows are less abundant, as in the pot-hole country about Prince Albert, Saskatchewan, losses are correspondingly less severe.

The methods of approach and the problem of the crow on waterfowl breeding grounds are first discussed. Nest observations and analysis of results, the food of crows as revealed by stomach examination, and the value of remedial measures are reported upon.

The shore birds, cranes, and rails: Willets, plovers, stilts, phalaropes, sandpipers, and their relatives deserve protection, A. A. Allen (*Natl. Geogr. Mag., 72 (1937), No. 2, pp. 183–222, pls. 16, figs. 4*).—This is the sixteenth of the series of articles describing the bird families of the United States and Canada, illustrated by paintings by A. Brooks (E. S. R., 76, p. 821).

Birds of the island of Java, I, II, N. Kuroda (*Tokyo: Author, 1933, vol. 1, pp. XV+370, pls. [15]; 1936, vol. 2, pp. VI+371–794, pls. [21]*).—A preface and an introduction to this work in volume 1 are followed by a historical sketch on the ornithology of Java (pp. 1–26). A description of the adults, distribution, field notes, and a brief synonymy are given for each form in the systematic part, which composes the remainder of the volume and treats the order Passeres. Volume 2, which treats the whole nonpasserine birds (pp. 371–695), includes a summary and conclusion, a table concerning the distribution of the avifauna of Java and the vicinity, lists of the avifauna occurring in the principal islands of the Lesser Soenda (Sunda) Islands, and a bibliography of 15 pages. Keys to the genera and species, indexes to the systematic and local names, and a sketch map of Java are included in both volumes. The work is illustrated by 34 colored plates, all but 1 of which, sketched by N. H. Kuroda, are by S. Kobayashi. The avifauna of Java at the time of preparation of the work consisted of 510 species and subspecies, representing 25 orders and 62 families.

A supplement to the Birds of Norfolk & Lord Howe Islands to which is added those birds of New Zealand not figured by Buller, G. M. Mathews (*London: H. F. & G. Witherby, 1936, pp. XIV+177, pls. [57], [figs. 7]*).—This supplement to the author's work on the Birds of Norfolk & Lord Howe Islands, said to be more properly a supplement to his Birds of Australia, both of which have been noted (E. S. R., 62, p. 447), includes the birds of New Zealand. Most of the forms are illustrated by colored plates.

Reptiles and amphibians in relation to celery insects in the Sanford, Florida, district, D. Stoner (*Fla. Ent., 19 (1937), No. 4, pp. 49–53, fig. 1*).—Observations of the amphibian and reptilian fauna of celery fields at Sanford, made during the course of studies particularly of the greenhouse leaf tier (E. S. R., 68, p. 356), are reported. Three successive autumn and winter seasons of 6 mo. each are said to have been devoted to field and laboratory work.

The life histories of three trematodes, parasitic in birds and mammals, belonging to the genus Plagiorchis, D. B. McMullen (*Jour. Parasitol., 23 (1937), No. 3, pp. 235–243, figs. 8*).—In experimental infections the adults of three species of trematodes of the genus *Plagiorchis*, namely *P. muris*, *P. micracanthos*, and *P. proximus*, were obtained. "The first intermediate host for

the three species has been found to be *Stagnicola emarginata angulata*. Usually the second intermediate hosts were aquatic insects. The precocious development of the cercariae into metacercariae without leaving the sporocyst was observed in *P. muris* and *P. proximus*. The adults of *P. muris* were obtained in experimental infections of man, rat, mouse, and pigeon. Natural infections were found in the nighthawk, robin, herring gull, and spotted sandpiper. Adults of *P. micracanthos*, a bat parasite, have been obtained in experimental mice. Adults of *P. proximus*, a parasite in the muskrat, have been obtained in small numbers in experimental mice."

Another record of avian schistosomes in North America, R. T. Young (*Jour. Parasitol., 23 (1937), No. 3, pp. 295, 296*).—The finding of schistosomes in a marbled godwit (*Limosa fedoa*) in California is added to the six or seven records on the finding of avian schistosomes in North America.

An introduction to entomology, J. H. Comstock (*Ithaca, N. Y.: Comstock Pub. Co., 1936, 8. ed., rev., pp. XIX+1044, pl. 1, figs. 1228*).—A new edition of this work (E. S. R., 53, p. 252), revised by G. W. Herrick.

A manual of entomological equipment and methods, II, A. Peterson (*St. Louis, Mo.: John S. Swift Co., 1937, pt. 2, pp. 334, pls. 21*).—Part 2 of the work previously noted (E. S. R., 72, p. 215) attempts a complete compilation of abstracts and original contributions on rearing information found in English. In addition, abstracts are included on "marking insects, shipping or transporting living insects and pinned specimens, collecting insects, and photography related to insects. No attempt, however, has been made to assemble all the literature on these topics. Many miscellaneous notes on museum and laboratory methods are also included. Some of these present information on sampling, catching, trapping, killing, mounting, preserving, dissecting, inflating, labeling, drawing, clearing, staining, insect diseases, pollination, plant disease transfer, etc." Part A of the index (pp. 315–326) takes up rearing information, the arrangement being by scientific and common names; part B (pp. 327–334), equipment and methods.

Effect of different soaps on formation of soluble arsenic from lead arsenate in soft and hard waters, J. M. Ginsburg (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 583–590*).—In experiments by the New Jersey Experiment Stations, conducted with lead arsenate mixed with soluble and insoluble soaps in soft and in hard water for the purpose of determining the extent to which soaps may safely be used as spreaders and correctives with arsenical sprays, it was found that "(1) water-soluble soaps increase the soluble arsenic in soft water in proportion to the amount of soap added; (2) hard waters form large amounts of soluble arsenic, especially when the hardness is due to carbonates or bicarbonates; (3) soluble soaps, added to hard water, prevent the formation of excessive amounts of soluble arsenic; (4) soluble soaps react with the salts present in hard water, precipitating the corresponding insoluble soaps which apparently do not affect the lead arsenate; (5) certain insoluble metallic soaps when added directly to the lead arsenate also prevent formation of water-soluble arsenic in hard water; (6) of the various salts causing water hardness the bicarbonates and carbonates are primarily responsible for the production of soluble arsenic from lead arsenate; [and] (7) while in hard water the presence of soluble soap may make lead arsenate safer on foliage, the addition of soaps to soft water may result in increased arsenical injury."

Supplements in dormant bordeaux sprays for insect control on citrus, W. L. Thompson (*Citrus Indus., 18 (1937), No. 1, pp. 8, 9, 21*).—Control work with citrus insects and mites conducted during 1936 in the Vero Beach sec-

tion by the Florida Citrus Substation is referred to, with particular attention to 4 of 12 different materials used in combination with bordeaux mixture. The details are presented in two tables.

Wettable sulfur as a supplement for lime-sulfur, copper, and zinc sprays, W. L. THOMPSON (*Citrus Indus., 18 (1937), No. 3, pp. 5–7, 18, 19, figs. 4*).—Wettable sulfur was found by the Florida Citrus Substation to be a safe and effective supplement for lime-sulfur, bordeaux mixture, and other copper sprays and for the recommended zinc sprays. Application at the rate of from 5 to 6 lb. per 100 gal. appears to be the most economical amount to add to lime-sulfur for citrus rust mite control. "A larger amount may result in a little longer period of protection, but the added cost of the material may offset that advantage unless the period is long enough to reduce the number of applications necessary during a season. If [purple] scale control is to be considered, the amount of wettable sulfur may be increased to advantage, especially if a weak solution of lime-sulfur is used. The same recommendations hold true in copper and zinc sprays; that is, if wettable sulfur is added for rust mite control 5 lb. per 100 gal. is sufficient, but if scale crawlers are present the amount should be increased to 10 lb."

Tests with summer-oil emulsions on peach, S. W. FROST (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 658–663, fig. 1*).—In experiments at the Pennsylvania Experiment Station "slight injury resulted from the applications of sulfur-oil combinations to peach during 1936. This was due partly to the extremely weakened condition of the trees, also to early dates of application. Although the percentage of injury indicated in the tables seems high, the actual injury to the trees was almost negligible. By selecting a suitable type of sulfur, the injury can be reduced. One percent actual soap by volume seems sufficient to kill the summer broods of peach lecanium [the terrapin scale]. One-half percent is not sufficient."

Effects of the alkaloid nicotine on the rhythmicity of isolated heart preparations from Periplaneta americana and Prodenia eridania, J. F. YEAGER and J. B. GAHAN (*Jour. Agr. Res. [U. S.], 55 (1937), No. 1, pp. 1–19, figs. 5*).—Experiments performed to detect the effects of different concentrations of nicotine upon the contraction rates of isolated insect heart preparations immersed in a perfusion fluid of known composition and temperature when the pH values of the fluid, with and without dissolved nicotine, fall within the approximate range of 6.8 to 7.8 are reported. The contribution is presented with a list of 44 references to the literature cited.

Effects of nicotine fumigation at short exposure and assumed high concentration, J. F. ALSTERLUND and C. C. COMPTON (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 571–575, figs. 3*).—This contribution from the Illinois Experiment Station, in cooperation with the Illinois Natural History Survey, presents evidence from a series of experimental greenhouse fumigations, together with data from outdoor field fumigation, of the pea aphid, which indicates that nicotine vapor is most efficient as an aphicide if an assumed high concentration of fumes is built up for a relatively short period, rather than maintaining a weaker dosage over a longer exposure. The qualification "assumed high concentration" is made since no reliable method of quantitatively sampling air for the presence of nicotine vapor was available. "The toxic action of the nicotine vaporizer in field fumigation of the pea aphid appears to be essentially similar to the spot fumigation of greenhouse aphids [chrysanthemum aphid]. In both cases there was a very short exposure to a comparatively dense concentration of nicotine vapor, with resulting high and consistent kill. In the greenhouse tests the spot fumigation method was clearly superior to the traditional practice of allow-

ing the nicotine vapor to diffuse equally throughout the house from stationary points."

Laboratory apparatus for fumigation with low concentrations of nicotine, with studies on aphids, H. H. Richardson and R. L. Busbey (*Jour. Econ. Ent., 30 (1937), No. 4, pp 576–582, figs. 3*).—A description is given of a laboratory apparatus in which "air flows varying in nicotine concentration from 42 to 0.25 p. p. m. (0.278 to 0.0016 mg per liter) have been obtained, thereby making possible toxicity studies with aphids. Still lower concentrations may evidently be obtained if desired. Glass containers with ground-glass connections are used in that part of the apparatus through which nicotine gas flows. Compressed air regulated by needle valves and measured by calibrated flow meters is used for air flows. Nicotine concentrations were determined by microchemical analysis of the gas. One-half-hr. exposures at 77°±0.9° F. were used in all tests.

"Nicotine fumigation was at first much more effective at low relative humidity than at high. Possibly the absorption of the nicotine by the presumably heavier film of moisture present, though invisible, on the inside of the fumigation chamber under high humidity conditions would account for the lower mortality, for after sufficient nicotine has passed through the chamber *the fumigation is just as effective at high as at low relative humidity.* Concentrations of one part nicotine per million parts air (0.0066 mg per liter) killed large numbers of the peach aphid (*Myzus persicae*) from nasturtium, which were used in most of the tests. The bean aphid (*Aphis rumicis*) from nasturtium was somewhat less resistant than *M. persicae*, whereas the pea aphid (*Illinoia pisi*) from pea was more resistant."

Semicommercial manufacture of nicotine peat, L. N. Markwood (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 648–651*).—An account is given of the semicommercial manufacture of nicotine peat from New Jersey reed peat and German moss peat. "New Jersey peat is screened for the removal of impurities, dried to a moisture content of 10 percent, soaked in 2 percent hydrochloric acid, washed free of soluble matter, and then treated with nicotine in the presence of water. The mixture is dried and ground to a fine powder. German moss peat is treated directly with nicotine. Analyses of the two products are given. The nicotine content is about 10 percent, and the nicotine insolubility is 88 percent of the total for the New Jersey product and 68 percent for the German product. Standard commercial equipment, including a vacuum dryer and a centrifuge, was used."

[Notes on economic insects and their control] (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 676–682*).—The notes here presented (E. S. R., 77, p. 507) include the following: Possible Migration of Diamondback Moth, by G. M. List (p. 676) (Colo. Experiment Station); Aseptic Rearing of Bark Beetles [*Dendroctonus* sp. and *Ips* spp.], by E. C. Holst (pp. 676, 677); *Diabrotica connexa* Lec. Transported in Vegetables, by L. J. Bottimer (p. 677); New Pest [*Tarsonemus bancrofti* Michael] of Sugar Cane in Continental United States, by J. W. Ingram (pp. 677, 678); Lime Sulfur to Control Forest Tent Caterpillar, by S. C. Jones (p. 678); Myiasis of Baby in Utah [Probably Due to *Wohlfahrtia meigenii* Shiner], by C. L. Rich and G. F. Knowlton (p. 678) (Utah Station); Recovery of Larvae [of the Raisin Moth and the Indian-Meal Moth] Paralyzed by *Microbracon hebetor* Say, by H. C. Donohoe (pp. 678, 679); Chemical and Insecticidal Tests of Samples of *Tephrosia toxicaria*, by H. A. Jones and W. N. Sullivan (pp. 679, 680); Indian-Meal Moth in California, by H. C. Donohoe (pp. 680, 681); Parasitism of Codling Moth Larvae by Native Parasites at Cornelia, Ga., in 1936, by J. E. Webb, Jr. (p. 681); and Relative Effectiveness

of Homologs of Paris Green Against Confused Flour Beetle, by W. W. Fassig and F. L. Campbell (pp. 681, 682).

Connecticut State entomologist, thirty-sixth report, 1936, W. E. BRITTON (*Connecticut* [*New Haven*] *Sta. Bul. 396* (*1937*), *pp. 298–415+XI–XVI, figs. 34*).—Following a brief account of entomological features, with insect records for 1936 (pp. 293–310) (E. S. R., 75, p. 657), the inspection of nurseries, 1936, by Britton and M. P. Zappe (pp. 314–323) and of apiaries by Britton (pp. 324–330) and control work with the gypsy moth by Britton, J. T. Ashworth, and O. B. Cooke (pp. 330–339), the European corn borer by Zappe, N. Turner, and J. C. Schread (pp. 340–345), together with a brief account of its heavy infestation of potatoes in Suffield by Turner and Zappe (pp. 345, 346), and with the Japanese beetle in Connecticut by J. P. Johnson (pp. 346–351) are reported upon. Notes on the hymenopterous parasites of elm insects in Connecticut, by B. J. Kaston (pp. 351–361); contributions on the satin moth, by Britton (pp. 361–364); tests of apple sprays, by Zappe and E. M. Stoddard (pp. 364–366); further notes on *Calomycterus setarius* Roelofs, by Zappe (pp. 367–370) (E. S. R., 75, p. 232); control of potato leafhoppers on dahlias, by Turner (pp. 370, 371); observations on the European red mite and its control (pp. 372–377), work with oriental fruit moth parasites (p. 378), further studies in control of the apple maggot (pp. 378, 379), notes on control of the tent caterpillar in orchards (pp. 379–381), a note on field and laboratory control of cankerworms (pp. 381, 382), a report on peach sprays (pp. 382, 383), experiments with control of the rosy apple aphid (pp. 383–385), and a study of several nicotine preparations and wetting agents for increasing their toxicity (pp. 385–387), all by P. Garman; the horned squash bug *Anasa armigera*, with a note on *A. repetita* (pp. 387–391) and control of the striped cucumber beetle (pp. 391, 392), both by R. L. Beard; observations on termites and termite control, by Turner, Zappe, and J. F. Townsend (pp. 392–396); and the present status of mosquito control work in Connecticut, by R. C. Botsford (pp. 396–399), follow.

Miscellaneous insect notes presented (pp. 399–411) include the following: Outbreak of Say's blister beetle, the greenhouse leaf tier, the hickory leaf roller, elms injured by the rose chafer, scarcity of the fall webworm, the pepper maggot *Zonosemata* (*Spilographa*) *electa* Say in Connecticut, damage by the poplar sawfly *Trichiocampus viminalis* Fall, peach foliage eaten by a flea beetle (*Chalcoides* (*Crepidodera*) *helxines* Linn.), peach trees injured by the New York weevil, the elm leaf beetle, prevalence of the forest tent caterpillar, a new mite on box (*Neotetranychus buxi* Garman), alders stripped by a sawfly (*Hemichroa americana* Prov.), damage by a new blister beetle (*Macrobasis torsa* Lec.), strawberries injured by *Diplotaxis atlantis* Fall, house timbers injured by anobiid beetles (*Anobium punctatum* DeGeer (*striatum* Oliv.)), the lime tree looper, prevalence of the psychid moth *Fumea casta*, the fall cankerworm, bird mites in a dwelling house, damage by the spring cankerworm, decrease of the eastern tent caterpillar, and a new weevil (*Hylobius radicis* Buch.) injuring pine in Connecticut.

[Report of work in entomology by the Idaho Station], C. WAKELAND (*Idaho Sta. Bul. 221* (*1937*), *pp. 30–33, fig. 1*).—The work of the year reported upon (E. S. R., 75, p. 658) relates to the production of very high kills of the beet leafhopper through the use of atomized petroleum oil, kerosene, and pyrethrum; increase in parasite control of the codling moth, San Jose scale, and woolly apple aphid; reduction of corn earworm injury through application of cryolite; control of the grape leafhopper by use of nicotine; increase in grasshopper and Mormon cricket populations; control of pea weevil by ap-

plication of derris and tobacco dust, cryolite, derris dust and diatomaceous earth, and derris dust and sulfur; and the influence of temperature and moisture on the movement of wireworms in soil.

[Report of work in economic entomology by the Kentucky Station] (*Kentucky Sta. Rpt. 1936, pt. 1, pp. 24, 25, 33, 34, 44–47*).—The work of the year reported (E. S. R., 76, p. 65) includes the use of oil-nicotine spray (E. S. R., 77, p. 69), control of wireworm injury to tobacco plants, effect of burning tobacco beds to control white grubs, the tobacco flea beetle, control of May beetles, soil insecticides, white grub survey, dormant treatment for aphid control in orchards, trapping for green June beetles, controlling red spider on raspberry, relation of the pea aphid to clover and alfalfa failure, and the use of poisoned bran bait to control June beetle larvae in tobacco beds (E. S. R., 77, p. 508).

[Work in entomology by the Massachusetts Station] (*Massachusetts Sta. Bul. 339 (1937), pp. 46–61*).—Reporting upon the work of the year (E. S. R., 75, p. 512), reference is made to investigation of oil sprays for dormant applications, spray materials for the control of the gladiolus thrips, substitutes for lime-sulfur in summer sprays for orchards, derris and pyrethrum for the control of the greenhouse leaf tier on snapdragons, control of the cabbage maggot with mercury compounds, and control of the squash borer and apple maggot, all by A. I. Bourne and W. D. Whitcomb; control of the onion thrips, the spray residue problem and possible substitutes for lead arsenate, the introduction of parasites of the oriental fruit moth in peach orchards, potato spraying experiments, and insecticides for the control of the European corn borer, all by Bourne; insects concerned in the dispersal of Dutch elm disease, including the native elm bark beetle and other elm-boring insects, by W. B. Becker (E. S. R., 77, p. 359); the apple leaf-curling midge *Dasyneura mali* Kieff., naphthalene and similar compounds as greenhouse fumigants, the plum curculio in apples, control of the common red spider, and the biology and control of the carrot rust fly, all by Whitcomb; and the adaptability of *Cryptolaemus* to control of mealybugs in the greenhouse, by Whitcomb and W. Garland.

[Report of work in entomology by the Puerto Rico College Station], G. N. Wolcott (*Puerto Rico Col. Sta. Rpt. 1935, pp. 11, 12, 41–49*).—A brief report is made of the work during the year (E. S. R., 74, p. 228) on the life history of *Diaprepes abbreviatus* L. (E. S. R., 77, p. 225), the "hormiguilla" (*Myrmelachista ramulorum* Wheeler) and its control in coffee groves, introduction of predators into and from Barbados, status of the imported toad (*Bufo marinus* L.) (E. S. R., 77, p. 212), control of the West Indian peach scale *Diaspis pentagona* Targ. on papaya, the cottony-cushion scale, lima bean pod borer control, parasitism of the coffee leaf miner, the banana root borer, and insects as pollinating agents in coffee groves.

Insect control (*Rhode Island Sta. Rpt. [1936], p. 17*).—Brief reference is made (E. S. R., 75, p. 810) to control work with the cabbage maggot in which calomel dust was found inferior to corrosive sublimate and with aphids which severely damaged peas and tomatoes even though nicotine sulfate sprays were applied several times.

[Contributions on economic insects in England] (*Jour. Southeast. Agr. Col., Wye, Kent, No. 40, (1937), pp. 98–107, 115–147, 183–186, figs. 30*).—The contributions relating to economic insects and similar pests and their control (E. S. R., 77, p. 219) are: Investigations on the Insect and Allied Pests of Cultivated Mushrooms—IX, *Tyroglyphus dimidiatus* Herm. (*longior*) Gerv., by S. G. Jary and J. H. Stapley (pp. 119–129) X, *Sciara varians* Johns., Its

Occurrence Within a Mushroom House, With a Description of the Male Genitalia, by M. D. Austin and R. S. Pitcher (p. 98), and XI, The Long-Legged Mushroom Mite *Linopodes antennaepes* Banks, by M. D. Austin (pp. 115–118), continuing the series noted below; Notes on Diplopoda—IV, The Recognition of Some Millipedes of Economic Importance, by S. W. Rolfe (pp. 99–107) (E. S. R., 72, p. 506); A Note on *Tyroglyphus longior* var. *castellanii* (Hirst) (p. 130), The Identity of *Tyroglyphus siro* L. (Gerv.) (pp. 131–133), and Tests of Insecticides Against *Anthonomus rubi* (Herbst) (pp. 134–147), all by S. G. Jary; and "Meta-Fuel" and Slug Control, by S. G. Jary and M. D. Austin (pp. 183–186).

Entomological investigations, G. A. JULIUS ET AL. (*Austral. Council Sci. and Indus. Res. Ann. Rpt., 10 (1936), pp. 22–29*).—The annual report on the progress of work with economic insects (E. S. R., 75, p. 808).

Biological control of noxious insects and weeds in New Zealand (*New Zeal. Jour. Sci. and Technol., 18 (1936), No. 7, pp. 579–593*).—A symposium in which, following an introduction by D. Miller (pp. 579–581), the biological control of noxious weeds is considered by D. Miller (pp. 581–584), of forest insect pests by A. F. Clark (pp. 585–588), of fruit pests in New Zealand by L. J. Dumbleton (pp. 588–592), and of field crop and animal insect pests by D. Miller (pp. 592, 593).

Economic insects and biological control in the British Solomon Islands, R. J. A. W. LEVER (*Bul. Ent. Res., 28 (1937), No. 2, pp. 325–331, figs. 3*).—This contribution reports upon biological control particularly of the hispid beetle *Brontispa froggatti* on young coconut palms and the buffalo fly *Lyperosia exigua* de Meij.

Investigations on the insect and allied pests of cultivated mushrooms, VI–VIII (*Jour. Southeast. Agr. Col., Wye, Kent, No. 38 (1936), pp. 67–74, figs. 4; 78–82, figs. 7; 83–85*).—Three papers are presented in continuation of those previously noted (E. S. R., 76, p. 825): Observations Upon the Tyroglyphid Mite *Histiostoma rostro-serratum* Megnin, by S. G. Jary and J. H. Stapley; Some Diagnostic Characters Used in the Determination of *Sciara* spp. (Family Mycetophilidae) Associated With Cultivated Mushrooms, by M. D. Austin and R. S. Pitcher; and Observations on the Larval Instars of *Sciara fenestralis* Zett., by R. S. Pitcher. Parts IX–XI are noted on p. 814.

[Work with cranberry insects by the Massachusetts Station], H. J. FRANKLIN (*Massachusetts Sta. Bul. 339 (1937), pp. 36–39*).—Economic insects of the year at the Cranberry Substation briefly reported upon (E. S. R., 75, p. 512) are the half-winged geometer *Phigalia titea* (Cram.), grape anomala (*Anomala errans* F.), fire beetle *Cryptocephalus incertus* Oliv., cranberry weevil, cranberry flea beetle *Systena frontalis* F., cranberry root grub *Amphicoma vulpina*, cranberry spittle insect (*Clastoptera*), gypsy moth, black-headed fireworm, and cranberry fruitworm and its parasite *Trichogramma minutum*. The use of kerosene-pyrethrum extract is discussed.

Insects of the British woodlands, R. N. CHRYSTAL (*London and New York: Frederick Warne & Co., 1937, pp. XIII+338, pls. [12]; [figs. 21]*).—The forest insects of Great Britain are dealt with in eight chapters. Descriptions of some important forest insect genera and species and a list of the more important forest insects considered are given in two appendixes. A bibliography of four pages is included.

The insect menace in the bacteriology laboratory, D. PEASE (*Jour. Bact., 33 (1937), No. 6, pp. 619–624*).—Attention is called to the danger of contamination in the laboratory of bacterial cultures by mites, particularly of the genera *Tyroglyphus* and *Tarsonemus*.

The control of mound colonies of Eutermes exitiosus Hill, F. G. Holdaway and G. F. Hill (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *9* (*1936*), *No. 2, pp. 135, 136, fig. 1*).—A simple method for destroying mound colonies of *E. exitiosus* at slight expense through the use of arsenical powders is described.

The grasshopper situation in Iowa, C. J. Drake and G. C. Decker (*Jour. Econ. Ent., 30* (*1937*), *No. 4, pp. 618–621*).—A report from the Iowa Experiment Station on grasshoppers and the grasshopper situation in that State.

The grasshopper outbreak in Queensland, 1934–35, J. A. Weddell (*Queensland Agr. Jour., 47* (*1937*), *Nos. 3, pp. 246–259, pl. 1, figs. 6; 4, pp. 354–364, figs. 14; 5, pp. 451–462, fig. 1*).—Part 1 of this contribution deals with the history of grasshopper outbreaks in Queensland, part 2 with the life history and habits of *Chortoicetes terminifera* Walk. in southeastern Queensland, and part 3 with control measures.

A study of spontaneous locomotor activity in Locusta migratoria migratorioides (R. & F.) by the actograph method, E. B. Edney (*Bul. Ent. Res., 28* (*1937*), *No. 2, pp. 243–278, figs. 16*).—A description is given of an actograph apparatus for recording in 24-hr. periods under controlled conditions the activity of *L. migratoria migratorioides* in terms of distance traveled. Great variation was observed in the amount of activity shown by different individuals, and the activity of any one individual is shown to vary considerably over each stadium, the highest level occurring about half-way between molts and falling off toward the beginning and end of each stadium.

Pristhesancus papuensis Stal., an "assassin" bug, N. S. Noble (*Jour. Austral. Inst. Agr. Sci., 2* (*1936*), *No. 3, pp. 124–126, fig. 1*).—Observations of the biology of this, the largest species of predaceous bug of the family Reduviidae occurring in Australia, are reported.

Resistance of certain varieties of apple trees to injury by the leafhopper Empoasca fabae, W. J. Schoene and G. W. Underhill (*Virginia Sta. Tech. Bul. 59* (*1937*), *pp. 16, figs. 9*).—Following a brief introduction and review of the history of the leafhopper *E. fabae*, officially known as the potato leafhopper and a serious pest of apple foliage, presented in connection with a list of 23 references to the literature, a study of the pest on apple foliage commenced in 1927 is reported.

It was observed that the injury by this leafhopper in 1927 was confined to the tender growing tips both on bearing trees and on nursery stock, and that the different varieties of nursery stock did not show the same degree of leaf curl, those having the most succulent foliage being most seriously curled. Severe injury to foliage was observed to occur over the period from May 20 to July 1. Although the leafhoppers continued to feed throughout the remainder of the growing season, they were found to be present in smaller numbers. It was found at Richmond that the adults occurred on nursery apple trees from April 15 until frost.

When large plantings of apple varieties in parallel rows were studied, some varieties of apple trees were found much more seriously injured than others. The leaf curl was very pronounced on the Early Harvest, Yellow Transparent, and Albemarle Pippin varieties and almost absent on Stayman Winesap, Winesap, and Jonathan. Altogether 58 varieties of apples have been studied and classified according to their susceptibility to leafhopper injury.

Evidently the leafhopper is not equally injurious to all varieties of plants on which it feeds, but the differences in degree of injury produced are less marked when the insects are very numerous. In the different years these observations were made there was some variation in the number of leafhoppers and also the amount of injury, but the range in injury was fairly consistent.

The susceptibility of apple varieties to leafhopper injury varied inversely with the amount of pubescence of the foliage. Varieties of apples having foliage with scant pubescence were subject to serious leaf curl. The varieties which had leaves with dense pubescence were curled only slightly or not at all.

The beet leafhopper in the central Columbia River breeding area, O. A. HILLS (*Jour. Agr. Res.* [*U. S.*], *55* (*1937*), *No. 1, pp. 21-31, figs. 7*).—The limited production of sugar beets due to the prevalence of curly top disease, transmitted by the beet leafhopper, in the Yakima Valley, a potential sugar beet-producing area, led to beet leafhopper surveys by the U. S. D. A. Bureau of Entomology and Plant Quarantine in the breeding area of the central Columbia Valley in south-central Washington and northeastern Oregon, from which populations are dispersed to the Yakima Valley and other surrounding territory.

Three broods of beet leafhoppers were found in this area, for which tumblemustard, alfileria, and Russian-thistle serve as the most important host plants. It was found that "the leafhopper usually disperses from this breeding area between May 20 and June 30, movements being more or less continuous during this period. Return to the fall and winter hosts, tumblemustard and alfileria, occurs during October and is largely a forced movement caused by the drying of the summer hosts, principally Russian-thistle. If germination of the fall hosts is delayed by drought until after Russian-thistle has dried, a high mortality is likely to result.

High percentages of curly top are directly correlated with large spring-brood populations of the leafhopper. Large populations of the summer and fall broods are relatively unimportant in this respect, except as they affect the magnitude of the spring brood the following year.

"Winter mortality is usually of comparatively little importance in this area. In only one winter of the four observed was there severe mortality, and this was due to subzero weather without snow cover, which not only subjected the insects to intense cold but killed their food plants as well.

"Seasonal variations in color patterns of the beet leafhopper have been observed in this area. In general, dark forms predominate during winter, greenish forms during spring, and straw-colored forms during summer."

Two mealybugs of the genus Puto attacking citrus, S. E. FLANDERS (*Pan-Pacific Ent.*, *12* (*1936*), *No. 4, pp. 196, 197*).—The occurrence of *P. yuccoe* Coq. on roots of young citrus trees in Ventura County, Calif., is reported, and notes are given on a species, probably *P. spinosus*, found on citrus in Australia and India.

Control of the mealy plum aphid, L. M. SMITH (*California Sta. Bul. 606* (*1937*), *pp. 34, figs. 12*).—A study of the control of the mealy plum aphid conducted in Placer County on table fruit varieties of plums and in San Joaquin County on drying or prune varieties, commenced in 1928 and continued through 1935, is reported. Studies by the author relating to the biology of this pest have been noted (E. S. R., 76, p. 507; 77, p. 364).

This aphid spends the spring and early summer on the plum and the fall on the cattail and reedgrass, with a return migration to the plum occurring in the fall followed by overwintering eggs laid on the trees. Its injury consists of curling and stunting of foliage, lessened growth of new wood, soiling of the bloom of plums, and splitting of the fruit. The elimination of secondary hosts was found to be impractical for areas less than 30 miles in diameter.

"Fall defoliation with leaf-killing sprays was found to be undependable and dangerous to the tree. Tests of single sprays of petroleum oil or soap, with or without nicotine, during the fall, winter, and spring failed to produce a satis-

factory control. Tests of multiple applications of petroleum oil or soap indicated that as many as three applications fail to give a complete kill. Earlier applications of spring sprays gave better results than later spring sprays, and spring sprays showed greater efficiency than fall sprays. The addition of nicotine increased the control to such an extent as to justify its use on a cost basis. Laboratory tests of petroleum oil showed a low kill of eggs, as was likewise the case in the field. Viscosity and unsulfonatable residue were not related to toxicity. Miscible petroleum oil emulsions were not more toxic than paste types. An increase of petroleum oil in the diluted spray resulted in an increase in kill of eggs. Of several materials added to petroleum oil, dinitro-orthocresol, a coal-tar product, gave by far the greatest increase in toxicity. A laboratory test of coal-tar distillate emulsion gave a high kill of eggs. Field tests of winter applications of coal-tar distillate in comparison to spring applications of oil and nicotine demonstrated a greater efficiency for coal-tar distillate. Tests in the field during the dormant period with five miscible and five paste type coal-tar distillate emulsions indicated that the paste type is more efficient. Laboratory tests corroborated this fact. Field tests of tar at five concentrations ranging from 0.5 to 4 percent indicated that 1.5 percent yields a good control when very efficient spraying is done, and that 2 percent is necessary for mediocre spraying. No injury has been done to the trees by tar sprays in any of the experiments reported herein. Increased tree growth follows an application of tar sprays, believed to be the result of absence of aphids. Tar sprays are caustic to men, and sprayers must protect themselves."

Notes on two new oriental parasites of the coffee mealy-bug Pseudococcus lilacinus, C. FERRIÈRE (*Bul. Ent. Res., 28 (1937), No. 2, pp. 315–320, figs. 2*).—*Pseudaphycus orientalis* and *Anagyrus lilacini*, parasites of the coffee mealybug *Pseudococcus lilacinus* in the Philippine Islands, are described as new.

Moisture as the factor affecting wing development in the citrus aphis Toxoptera aurantii Boy., E. RIVNAY (*Bul. Ent. Res., 28 (1937), No. 2, pp. 173–179*).—The author, in work at the Agricultural Research Station at Rehovoth, Palestine, found that temperature does not affect wing development in the black citrus aphid. A great percentage of aphids developed wings when they were crowded, or when they were forced to feed on stale or wilted food. This was due to the small amount of food and particularly of water which each individual aphid obtained. A reduced percentage of water in the food of aphids, as well as a low atmospheric humidity, are primary factors causing wing development. All the factors such as light, temperature, crowding, humidity, precipitation, growth of plant, etc., exert, directly or indirectly, an influence on the water balance in the body of the aphid, which in turn causes wing development.

Control of oyster-shell scale on apple by means of tar oils, tar-lubricating oils, and lubricating oils containing dinitro-o-cyclohexylphenol, F. Z. HARTZELL and J. B. MOORE (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 651–655*).—The experiments at the New York State Experiment Station here reported indicate that "coal-tar oil emulsions, when used at not less than 4.5 percent of tar oil, are of value in the control of the oystershell scale on apple and that the efficiency is increased by the addition of 1 percent of lubricating oil. Also that lubricating oil in which has been dissolved about 4 percent of dinitro-o-cyclohexylphenol will give excellent control of the insect if the oil content of the spray mixture is not less than 4 percent. Water-gas tar oil cannot be regarded from these tests as being of much value for the control of oystershell scale on apple unless lubricating oil is added, and even then the results do not equal those secured with coal-tar oil or with lubricating oil containing

"Like tar oils, dinitro-o-cyclohexylphenol in oil must be applied before the silver-tip stage of the apple buds has been reached if injury to the latter is to be avoided. With all the mixtures practically no injury occurred to apple buds sprayed while dormant in the spring; that is, before the green-tip stage, provided the oils were well emulsified."

The life cycle and seasonal history of Ceroplastes rubens, B. BLUMBERG (*Roy. Soc. Queensland, Proc., 46 (1934), pp. 18–32, pl. 1, figs. 6*).—This contribution on the scale pest *C. rubens* Mask., originally described from Australia and now a common citrus pest throughout coastal Queensland (where it is thought to have been introduced from Ceylon and from there spread to Japan and the Hawaiian Islands), reports upon the life cycle of the female, its seasonal history, and miscellaneous observations, including its parasites and predators.

Control of cabbage worms, H. G. WALKER and L. D. ANDERSON (*Virginia Truck Sta. Bul. 93 (1936), pp. 1379–1394, fig. 1*).—Report is made of control studies with green cabbage worms representing three species, namely, the diamondback moth, which caused heavy losses during the past 5 yr.; the cabbage looper, also very destructive; and the imported cabbage worm, which caused occasional damage. All of these are important enemies of cole crops, and the cabbage webworm was injurious to young cabbage plants in the vicinity of Norfolk in the late summer and fall of 1932.

"Repeated applications of derris and cube dusts containing from 0.5 to 0.75 percent rotenone and from 2 to 3 percent total extractives, and pyrethrum dusts containing from 0.3 to 0.5 percent pyrethrins have given good control of these cabbage worms, while dusts of weaker concentrations of rotenone and pyrethrins were less effective. Also, certain arsenical dusts have given good control, but they should be used only early in the growing season because of the residue hazard. Derris and cube dusts having approximately the same rotenone and total ether extractive content appeared to be about equally effective for the control of these pests. Talc, finely ground tobacco dust, finely ground clay, finely ground dusting sulfur, and dusting gypsum proved to be satisfactory diluents for derris, cube, and pyrethrum powder, but strongly alkaline materials, such as hydrated lime, should not be used in combination with these powders because alkaline substances have a tendency to break down their toxic properties. A mixture of one part by weight of paris green to five parts of lead arsenate gave promising results for the control of the cabbage webworm."

The hymenopterous parasite *Angitia hellulae* frequently parasitizes over 90 percent of the larvae of the diamondback moth, but it has not prevented this pest from causing heavy losses each year for the past 5 yr.

The twig girdler moth of Australian nut trees, C. R. WALLACE (*Agr. Gaz. N. S. Wales, 47 (1936), No. 10, pp. 566–568, figs. 3*).—This is a report on the xyloryctid moth *Xylorycta luteotactella* (Walk.), the larvae of which damage nut trees (*Macadamia ternifolia* and *M. integrifolia*) on the north coast of New South Wales, (1) through eating the bark at the axils and finally girdling the twig and (2) by destroying the leaf tissue, frequently skeletonizing the basal halves of the leaves.

Orchard experiments with natural cryolite for codling moth control, I. D. DOBROSCKY (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 656–658*).—It is concluded from the experiments conducted that, since both the arsenic trioxide and the fluorine residues are below the tolerance limit, a spray schedule consisting of four lead arsenate sprays and two natural cryolite sprays would be the solution to the residue problem as well as that of codling moth control.

The oriental peach moth in Virginia apple and peach orchards, W. J. Schoene, L. R. Cagle, M. L. Bobb, and R. N. Jefferson (*Virginia Sta. Bul. 308* (*1937*), *pp. 23, figs. 17*).—Data obtained in studies with bait pails in orchards containing both apple and peach trees near Roanoke during the years 1929–36, inclusive, are reported. Bait pails were also placed in orchards containing only apple trees. It was always possible to collect adults of the oriental fruit moth in apple orchards, but no very great injury to the fruit of winter varieties was observed. While the insect can subsist in orchards with apple as the only food, it is believed that the small size of the fruit at the time when the first brood larvae are hatching serves as an annual check. This was indicated by the small number of moths caught in apples during the first brood in contrast with the much larger number caught during the spring brood. That the small number of moths that survive are able to build up to considerable numbers before harvest was evident in all collections.

"The large number of moths caught throughout the season in apple orchards adjacent to peaches in contrast with the small number caught in apple orchards some distance from peaches indicates that the moth population in apples is increased by the presence of peaches. In orchards containing both apples and peaches the greatest catch of moths during the spring brood was always made in pails near the dividing line between apple and peach orchards, whereas, during the first and second broods, the insects were decidedly more abundant in the peach orchard, only a few moths being caught in apples except in those trees near the peaches. It seems apparent that the increase in the catch of moths in the pails in peach trees next to the apple orchard in the spring was brought about by moths that had developed from larvae that had overwintered in the apple orchard.

"It is concluded as a result of this study that the peach moth can inflict very serious injury to the peach crop when the conditions are favorable for the development of the insect, but that in many years the dry weather in early summer causes the hardening of the twigs, reducing the number of larvae with a consequent reduction of injury to the peach fruit. No serious injury to apple twigs or fruit was observed, although the moths were caught each year in considerable numbers in bait pails exposed in apple trees. The apple supplies food for the larvae in the fall when there are no peaches and when peach twigs are not suitable for food. The data indicate that when apples and peaches are adjacent to each other, the moth population is greater than it is when the two fruits stand alone.

"The practice of planting peach trees and apple trees in the same orchard, so common in Virginia some years ago, created conditions that were especially favorable to the peach moth. This practice has largely been discontinued because the two fruits require different spray treatments. Whenever possible, new plantings of apple trees or peach trees should be made at some distance from older plantings. The observations reported in this bulletin indicate that keeping the new plantings of peaches a few yards distant from older established plantings will tend to discourage the peach moth and reduce its damage.

"Past experience in Virginia indicates that it is practically impossible to grow profitable crops of late varieties of peaches, and that varieties that mature later than the Elberta should not be planted."

Homaledra sabalella Chambers, the major pest of palms in Florida, J. T. Creighton (*Jour. Econ. Ent.*, *30* (*1937*), *No. 4*, *pp. 590–595*, *figs. 2*).—A study of the palm leaf miner *H. sabalella*, which attacks many varieties of palms and palmettos, decreasing their value for decorative purposes in Florida, is reported upon. The larvae of this lepidopteran, which live in

colonies of from 35 to 100, are a source of injury to trees of the family Palmaceae only. Its natural enemies include a coleopterous predator *Plochinomus amandus* Newm., which is found extensively in the Gainesville area, and six hymenopterous parasites, which have been found attacking the pest in Florida, namely, *Cryptieropsis orbus* Say, *Apanteles* sp., *Horismenus* n. sp., *Eupelmus limneriae* How., *Bassus difficilis* Mues., and *Macrocentrus* sp.

The cotton web-spinner, W. J. S. SLOAN (*Queensland Agr. Jour., 46 (1936), No. 6, pp. 718–728, figs. 4*).—*Loxostege affinitalis* Led., which came to attention in the Callide Valley of Queensland 5 yr. previously, but the first outbreak of which took place in the season 1935–36 and was confined mainly to the Callide and Dawson Valleys, is reported upon.

The overwintering of the larvae of Tortrix postvittana Walk. in apple orchards, J. W. EVANS (*Jour. Austral. Inst. Agr. Sci., 2 (1936), No. 4, pp. 169, 170*).—Notes are presented on the light brown apple moth *T. postvittana*, a species indigenous to Australia, where it is seldom of serious economic importance. It is responsible for a considerable amount of damage to fruit in certain apple-growing districts of Tasmania, and has been introduced into New Zealand.

Seek effective control of corn ear worm, L. A. CARRUTH (*Farm Res. [New York State Sta.], 3 (1937), No. 4, pp. 6, 14, figs. 4*).—A brief account is given of the progress of control work with the corn earworm (particularly through clipping the silks) now being conducted on Long Island, where in the section centered near Roslyn it may infest more than 75 percent of the sweet corn during the latter part of the growing season.

An account by Carruth and Kerr, Jr., of the reaction of this pest to light traps has been noted (E. S. R., 77, p. 369).

Gall-midges (Cecidomyidae) whose larvae attack fungi, J. A. T. ANDERSON (*Jour. Southeast. Agr. Col., Wye, Kent, No. 38 (1936), pp. 95–107*).—This coordination of the present knowledge of the gall midges (Cecidomyidae) of the world whose larvae feed on, or are associated with, fungi, contributed from the Rothamsted Experimental Station, includes a systematic list of the fungi attacked by larvae.

Almond and peach buds attacked by a gall midge in Greece, H. F. BARNES (*Jour. Southeast. Agr. Col., Wye, Kent, No. 38 (1936), pp. 75–77, fig. 1*).—A detailed description is given of a gall midge attacking almond and peach buds at Attica that should be known as *Odinadiplosis* (*Cecidomyia*) *amygdali* (Anagnos.).

Sheep blowfly investigations: The effect of trapping on the incidence of strike in sheep, I. M. MACKERRAS, M. E. FULLER, K. M. AUSTIN, and E. H. B. LEFROY (*Jour. Council Sci. and Indus. Res. [Austral.], 9 (1936), No. 3, pp. 153–162, figs. 2*).—These experiments have demonstrated that intensive trapping of blowflies decidedly reduces the incidence of strike in sheep. No attempt was made to determine whether trapping is an economical method.

Outbreaks of Stomoxys calcitrans L. ("dog flies") along Florida's northwest coast, W. V. KING and L. G. LENERT (*Fla. Ent., 19 (1936), No. 3, pp. 33–39, figs. 3*).—An investigation is reported of the source of swarms of the stablefly, known locally as "dog fly," that begin to appear as a rule during the latter part of August or first part of September and infest parts or all of the 200-mile section of the Gulf coast forming the southern boundary of the western arm of Florida and extending approximately from Carrabelle on the east to Pensacola Beach on the west. The pest has been found by the authors to develop in accumulated piles of *Sargassum*, probably *S. filipendula* and *S. pteropleuron*, known locally by various names and more generally as gulfweed, that are found in wet swales and at the edge of water with a salt

content of 2.5 percent or perhaps higher. Appearing at times in enormous numbers, the flies are responsible for the closing of beach resorts during the fly period of 2 mo. or more. Livestock, particularly cattle, suffer intensely from their attacks. Fishermen are greatly plagued, and their sudden appearance many miles from shore is said to be a common occurrence. Flies from the coast apparently migrate inland for from 10 to 15 miles or possibly as far as 25 miles in the worst seasons.

On the life history and the biology of the rat-flea (Nosopsyllus fasciatus (Bosc.)), M. SHARIF (*Parasitology, 29 (1937), No. 2, pp. 225–238*).—Following a brief summary of earlier work on the rat flea, studies on its biology, particularly the nutritional requirements of the larva, details of which are given in tables, are reported. A list is given of 24 references to the literature.

Progress of Japanese beetle suppression in St. Louis, J. C. DAWSON (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 611–614*).—In reporting upon the control work with the Japanese beetle, conducted in St. Louis during the past 3 yr., the results of trapping in 1936 are said to have shown such activities to have been quite successful.

White grub devastations in Iowa nurseries, F. ANDRE (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 615–618, figs. 2*).—Contributing from the Iowa Experiment Station, white grubs, which each year damage numerous pastures and various cultivated crops, are said to cause some occasional damage to nursery stock, such infestation having been unusually heavy in nurseries in 1936. In the rearings during that year, of more than 800 larvae secured from the various nursery plantings, 465 reached the adult stage, all of which proved to be *Phyllophaga implicita* (Horn).

White grub damage to pastures on the Atherton Tableland, J. H. SMITH (*Queensland Agr. Jour., 46 (1936), No. 4, pp. 446–467, figs. 3*).—The scarabaeid *Lepidiota caudata* has been a serious pest of pastures in the Malanda district of Queensland and is the most destructive pasture species in the State. Its white grub activity has been confined to the most acid soils.

Investigations of the natural enemies of the Colorado potato beetle in America [trans. title], J. BRUNETEAU (*Ann. Épiphyt. et Phytogénét., n. ser., 3 (1937), No. 1, pp. 113–135, figs. 14*).—The collection and rearing of the natural enemies of the Colorado potato beetle and their introduction into France from the United States by the author in 1933 are first reviewed. This is followed by a report of observations while engaged in work relating particularly to *Lebia grandis* Hentz, *L. atriventris* Say, *Perillus bioculatus* Fab., *Podisus maculiventris* Say, *Doryphorophaga doryphorae* Riley, and *D. aberrans* Town., with notes on other predators and on secondary parasites.

The biological control of an insect in Fiji: An account of the coconut leaf-mining beetle and its parasite complex, T. H. C. TAYLOR (*London: Imp. Inst. Ent., 1937, pp. X+11–239, pls. 23, figs. [19]*).—The introduction of natural enemies, particularly the eulopid parasite *Pleurotropis parvulus* Ferr., into Fiji from Java and their control of the serious leaf-mining beetle (*Promecotheca reichei* Baly) enemy of the leaf of the coconut palm is reported upon. Following a brief introduction, a detailed account is given of the history of this hispid beetle and its parasite and predator enemies in Fiji prior to 1933, of *P. reichei* as an insect of economic importance prior to 1933, the nature and extent of control exercised by parasites and other factors prior to 1933, the search for parasites for its control, the hispids and parasites concerned and the selection of parasites, of *Pleurotropis parvulus*, introduction into Fiji of parasites from Java and the consequent control of *Promecotheca reichei*, and methods employed for breeding and studying *Promecotheca* and its parasites and for collecting data in the field.

P. reichei is the third coconut pest to be controlled in Fiji through the introduction of natural enemies, the zygaenid moth *Levuana iridescens* B. B., a serious menace to the coconut industry in Fiji, having been completely suppressed by the tachinid parasite *Ptychomyia remota* Ald. (E. S. R., 64, p. 460) introduced from Malaya, and the coconut scale *Aspidiotus destructor* Sign. by the coccinellid beetle *Cryptognatha nodiceps* Sic. introduced from Trinidad (E. S. R., 73, p. 353).

A list of 28 references to the literature is included.

Blapstinus substriatus Champion, a sporadic wheat pest in Montana, G. A. MAIL (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 670–675, fig. 1*).—Observations of the beetle *B. substriatus*, which is normally present every year in small numbers over a wide area of the State, are contributed from the Montana Experiment Station. "Dry weather conditions with an absence of precipitation in the spring would appear to insure optimum conditions for an increase of this beetle to outbreak proportions. Following the heavy spring rains of 1932 no further trouble was experienced from this pest in areas severely attacked during the previous year. The wide distribution of this beetle and its general feeding habits render it, therefore, a potential source of trouble should climatic conditions at any time favor its increase. Under field conditions standard poisoned bran mixtures were effective in controlling this pest."

A note on the reduction in the fecundity of Tribolium confusum due to eating its own eggs, J. STANLEY (*Canad. Jour. Res., 15 (1937), No. 5, Sect. D, p. 111*).—This note supplements the contribution previously noted (E. S. R., 68, p. 359).

Effect of growth of pea weevil on weight and germination of seed peas, T. A. BRINDLEY and F. G. HINMAN (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 644–670, figs. 6*).—The authors have found that "the loss in weight and viability of weevil-infested peas is correlated with the development of the pea weevil, and therefore increases rapidly with each successive day until the larvae within them have finished feeding. During some seasons 100-percent weevil-infested peas, when fumigated as soon as they ripen, will germinate nearly as well as sound peas. Weight loss in 100-percent weevil-infested Alaska peas may be as high as 22.4 percent, in comparison with 1.1 percent weight loss in sound peas."

The vetch bruchid (Bruchus brachialis Fahraeus), J. S. PINCKNEY (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 621–632, figs. 3*).—The vetch bruchid, which is widely distributed in Europe, Algeria, and Anatolia (Asia Minor), was first discovered in the United States on June 24, 1930, at Haddon Heights, N. J., by Bottimer (E. S. R., 69, p. 696). Since that time it has spread, and now occurs in the South Atlantic States as far south as Georgia. Its importance as a pest of vetch seed has been demonstrated by the recent heavy losses resulting from its attacks. "This insect has one generation a year and does not breed in dried seed. The eggs are laid on the green pods in the spring. The larvae feed within the seed and complete their development there. The adults emerge during summer. The hibernation habits of the species are unknown. There appears to be wide variation in the susceptibility to attack by the bruchid of the various species of vetch, the smooth and hairy varieties of *Vicia villosa* being most generally and most severely infested.

"The greatest danger of transportation out of the infested area lies in the shipment of vetch hay and in the movement of seed before all the beetles are dead in the seeds and sacks. Interception of living beetles in commercial shipments from Europe in 1936 indicates that fumigation of the seed will

be necessary for all shipments. Fumigation with hydrocyanic acid gas, both under vacuum and at atmospheric pressure, was found to be effective. The effectiveness of carbon disulfide as a fumigant for the adult vetch bruchid was indicated. Viability of vetch seed apparently was not reduced by fumigation with hydrocyanic acid gas."

Notes on the ecology and control of pine beetles in Great Britain, H. S. Hanson (*Bul. Ent. Res., 28 (1937), No. 2, pp. 185–242, pls. 3, figs. 8*).—This contribution considers the economic status of pine beetles, particularly *Myelophilus piniperda*, in Great Britain, with an analysis of damage, and reports upon the occurrence of outbreaks, factors influencing the pine beetle population, and silvicultural treatment and forest hygiene.

The introduction from Fiji into Puerto Rico of a predator of the banana corm weevil, K. A. Bartlett (*Puerto Rico Sta. Agr. Notes No. 79 (1937), pp. 3*).—The successful introduction from Fiji of the histerid predatory beetle *Placsius javanus* Arr., the only known effective natural enemy of the banana root borer, is recorded. A total of 537 individuals have been liberated on the island.

Three weevils of the genus Rhynchites injurious to fruit, S. W. Rolfe (*Jour. Southeast. Agr. Col., Wye, Kent, No. 38 (1936), pp. 86–94, figs. 9*).—Notes are given on three weevils that have been recorded during recent years attacking fruit, namely, the apple twig cutter *R. coeruleus* DeG., the strawberry leaf cutter *R. germanicus* Hbst., and *R. aequatus* L.

The Queensland pine beetle and its control, A. R. Brimblecombe (*Queensland Agr. Jour., 46 (1936), No. 5, pp. 582–585, pl. 1*).—The ptinid borer *Calymmaderus incisus* Lea, a pest of major importance to houseowners in southeastern Queensland but which confines its damage entirely to hoop pine, is reported upon.

Beekeeping (*Alaska Sta. Bul. 6 [1937], pp. 22–24, fig. 1*).—Reference is made to honey production, tables being given which show the daily weights of hives at the station over the 30-day period from July 25 to August 24, 1936.

The influence of colony populations on honey production, C. L. Farrar (*Jour. Agr. Res. [U. S.], 54 (1937), No. 12, pp. 945–954, fig. 1*).—In this contribution the author outlines a method for analyzing the influence of colony populations on production and reports upon the preliminary results of studies of this relationship carried on by the Intermountain States Bee Culture Field Laboratory, at Laramie, Wyo.

"A high correlation and a linear relationship were found to exist between the populations of small groups of colonies and their respective productions during periods of less than 2 weeks when all colonies had access to the same source of nectar for the same period of time. The production level varied between seasonal or locality segmental groups of colonies owing to differences in the amount of nectar available, but the relative production slopes of 16 segments when reduced to standard production factors per unit of bees were found to be fairly similar."

A method was developed for standardizing segmental population-production data to a standard honey-flow level by averaging the actual regression lines of the segmental data.

The conclusion is drawn from the production factors derived that the production efficiency of colonies increases as the population increases throughout the normal population range of 15,000 to 60,000 bees.

Relation of size to fecundity in queen honeybees, J. E. Eckert (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 646–648*).—The results of studies reported indicate "that the body measurements of the queen that were studied cannot be

used as criteria of fecundity. The results are of further significance in that they indicate but little correlation between the development of the external parts and of the internal characters studied. Evidently, therefore, other factors must be included with these values in future studies of this problem. Our studies would justify the suggestion that one might find a definite correlation between such characters as external size and the total development of the ovaries in queen honeybees if one could gauge accurately the size of ovaries by their length or weight as well as by the number of ovarioles. These factors are influenced by many physiological conditions as well as by unmeasurable environmental entities. The use of a greater number of individuals in determining the relation between the size of ovary and brood production and the use of an average of a series of brood counts over a longer period might be expected to smooth out certain errors that are magnified in importance when one is dealing with the number available in the present studies."

Further contribution to the study of pollen substitutes, M. H. HAYDAK (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 637–642, fig. 1*).—In continuation of work at the Minnesota Experiment Station (E. S. R., 76, p. 369), it was found that "bees can develop their bodies normally when fed soybean flour, soybean meal, peanut meal, linseed meal, or soybean meal, linseed meal, and cottonseed meal, each mixed with powdered skim milk, 20 percent by weight. The lowest mortality was observed in the linseed meal-fed colony, the highest in that which had soybean meal for food. The behavior was normal in all the experimental colonies. Only those colonies which had pollen, soybean flour, soybean meal, or cottonseed meal, [the last two] mixed with skim milk powder, produced young bees. The largest number was reared by the control colony. The young bees produced by the colonies which reared brood were normal, but those produced by the soybean meal-skim milk powder-fed colony had the lowest weight and nitrogen content. Building activity was normal in all the colonies."

Alleged vitamin E content in royal jelly, H. M. EVANS, G. A. EMERSON, and J. E. ECKERT (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 642–646*).—Data presented in three tables failed to show vitamin E activity when royal jelly, its fat-soluble fraction, or pollen from the comb was fed to young female rats of proved sterility. The results are considered highly significant, since the quantities of royal jelly fed were far greater than previously reported by other workers.

Preliminary report on American foulbrood, R. S. FILMER (*Jour. Econ. Ent., 30 (1937), No. 4, pp. 634–637*).—Reference is made to the progress of research work by the New Jersey Experiment Stations (1) in an effort to find colonies of bees which exhibit some degree of resistance to infection by American foulbrood and (2) for a more efficient method for sterilizing infected equipment.

The results show that "radio frequency oscillations of the nature used in these experiments are not lethal to the spores of *Bacillus larvae* when scales of larvae dead from American foulbrood are treated for various time intervals. It was found in this study that the time intervals could not be greatly increased because of a tendency for the scale material to heat rapidly which caused it to char and burn. In all cases where the exposure time was less than 60 sec. the scale material was ignited and was removed for testing before it was destroyed. The rapid heating of the scale material by radio frequency oscillations used in this experiment would prevent its use as a sterilizing agent for infected comb material."

The citrus gall wasp Eurytoma fellis Girault, N. S. NOBLE (*N. S. Wales Dept. Agr., Sci. Bul. 53 (1936), pp. 41, figs. 18*).—A study of the morphology, biology, etc., of *E. fellis*, which causes severe galling of citrus on the north coast of New South Wales, is reported upon.

The introduction and colonization in Puerto Rico of Macrocentrus ancylivorus, K. A. BARTLETT (*Puerto Rico Sta. Agr. Notes No. 80 (1937), pp. 4*).—The introduction and release of 7,284 oriental fruit moth parasites (*M. ancylivorus*) from the United States as a means of control of the lima bean pod borer and/or related borers (*Maruca testulalis* Geyer and *Fundella cistipennis* Dyar) are reported.

Euplectrus agaristae Crawford, a parasite of the grape vine moth Phalaenoides glycinae Lew., N. S. NOBLE (*Jour. Austral. Inst. Agr. Sci., 2 (1936), No. 4, pp. 165–168, figs. 2*).—A study of the biology of the eulophid chalcidoid *E. agaristae*, the larvae of which are gregarious external parasites of the larvae of the grapevine moth *P. glycinae*, a common pest of the grapevine in New South Wales, is reported. The average length of life of 271 individuals in the laboratory was 49.78 days, with a minimum of 6 days and a maximum of 187 days. The fact that the parasite larva feeds externally on a host larva which is itself feeding externally and is not paralyzed prior to parasitization is unusual, as is also the construction of a cocoon by a chalcid larva and the secretion of the silk from the Malpighian tubes through the anus of the larva.

Notes on the life-history of Eriophyes carinatus Green, C. B. REDMAN KING (*Bul. Ent. Res., 28 (1937), No. 2, pp. 311–314*).—Notes are presented on *E. carinatus*, commonly known in Ceylon as purple mite, which also occurs in north India and Java but has not become sufficiently important as a tea pest to require artificial control measures.

ANIMAL PRODUCTION

[Livestock investigations in Alaska], D. L. IRWIN (*Alaska Sta. Bul. 6 [1936], pp. 13–15, 25, fig. 1*).—Information is presented on the performance of foundation herds of Rambouillet sheep and Guernsey cattle at the Matanuska Substation.

[Livestock investigations in Idaho], H. P. MAGNUSON, C. W. HICKMAN, R. F. JOHNSON, J. TOEVS, and C. E. LAMPMAN (*Idaho Sta. Bul. 221 (1937), pp. 8, 9, 20–22, 23, 24, 25, 42, 43, 45, 48, 49, 50–53*).—Beef cattle studies reported include phosphorus deficiencies in different sections of the State, the negative response of fattening steers to phosphorus supplements in a ration, and at the Caldwell Substation wheat bran v. oats with barley for fattening calves, and feeding yearling steers on pasture.

The results of sheep studies are noted on the response of fattening lambs to phosphorus supplements in the ration, the occurrence of overshot and undershot jaws in sheep, artificial insemination of ewes, and from the Caldwell and Aberdeen Substations on wintering ewes and spring lamb production, cottonseed meal v. bonemeal as sources of phosphorus for lambs, deferred grain feeding for fattening lambs, the relative gains of yearling wethers v. lambs, and shearing feed lot lambs. The inheritance of inverted nipples in swine has been studied.

Poultry tests gave information on the vitamin A requirements of laying hens, the relative protein requirements of turkeys and chickens, and the artificial incubation of pheasant eggs.

The carotene content of dehydrated alfalfa products is noted.

[Livestock investigations in Kentucky] (*Kentucky Sta. Rpt. 1936, pt. 1, pp. 14–18, 36, 37, 47, 48, 52, 53*).—Among the studies discussed are cottonseed meal v. distillers' dried grains for fattening steers; distillery slop for hogs; a comparison of oats and rape, bluegrass, alfalfa, and lespedeza pastures for hogs; roughages for breeding ewes in winter and spring; the chemical composition of several grasses, lespedeza, alfalfa, red clover, and corn; comparative returns from continuous v. alternate grazing of permanent pastures with heifers, and the nutrient content of canned dog feeds.

Poultry experiments reported include protein levels for pullets, Kentucky bluegrass as a source of protein for growing chicks, lespedeza byproducts and distillery byproducts for feeding chickens, turkey incubation studies, the use of laying mash for chicks, and the cholesterol content of fresh and storage egg yolks.

[Investigations with livestock in Massachusetts] (*Massachusetts Sta. Bul. 339 (1937), pp. 21, 22, 85, 86, 87*).—Brief results are reported on the relation of birth weight to vitality and growth rate in lambs, by R. W. Phillips; and progeny performance in sheep, by C. H. Parsons, R. C. Foley, and J. C. Hillier. From poultry tests results were noted on broodiness in poultry, rate of feathering and breeding for plumage color in Rhode Island Reds, and breeding for low mortality, all by F. A. Hays; breeding for egg production, by Hays and R. Sanborn; and breeding for high and low resistance to fowl paralysis, by Hays, W. C. Sanctuary, and J. H. Vondell.

The time of cutting hay, and the losses entailed during haymaking, S. J. Watson, W. S. Ferguson, and E. A. Horton (*Jour. Agr. Sci. [England], 27 (1937), No. 2, pp. 224–258*).—This is an extensive report of 6 years' experimentation on the composition, digestibility, and yield of meadow hay cut at a normal time and also at immature stages.

The nutritive value of meadow hay, S. J. Watson and W. S. Ferguson (*Jour. Min. Agr. [Gt. Brit.], 44 (1937), No. 3, pp. 247–260*).—Information is presented on the chemical composition, digestibility, and nutritive value of 22 samples of hay collected from 15 counties in Great Britain during 1935. Linear regression equations are presented whereby the protein equivalent value may be estimated from the crude protein content of a given feed and the starch equivalent estimated from a combination of the crude fiber and crude protein contents.

Grass silage: A comparison of the changes involved in the ordinary, molasses, and A. I. V. processes, W. M. Davies, G. H. Botham, and W. B. Thompson (*Jour. Agr. Sci. [England], 27 (1937), No. 2, pp. 151–161*).—Results obtained at the Harper Adams Agricultural College are presented on the palatability and keeping quality, composition, digestibility, and losses in grass silages prepared in the ordinary method and with additions of molasses or mineral acids (A. I. V. process).

All silages seemed quite palatable to cattle, but the A. I. V. proved less palatable than the others for sheep. Digestibility, based on dry matter content, was highest for the A. I. V. silage and lowest for the ordinary silage. Losses of crude dry matter during ensiling were lowest in the molasses lot, highest in the ordinary, with A. I. V. intermediate, while losses of digestible nutrients, starch equivalent, and true protein were lowest in the A. I. V. and highest in the ordinary silage. From the standpoint of applicability to farm practice the molasses process is the most highly recommended.

A study of the chemical and bacteriological changes occurring in grass silage, L. A. Allen, J. Harrison, S. J. Watson, and W. S. Ferguson (*Jour. Agr. Sci. [England], 27 (1937), No. 2, pp. 271–293, figs. 4*).—Results of this study indicate that the chemical changes associated with the fermentation of grass

silage result in a rapid development of acidity which lowers the pH of the mass from approximately 6.5 to between 5.0 and 3.5. Normally acidity is due almost entirely to the development of lactic and acetic acids. Proteolysis occurs at early stages, but is normally checked by the increasing acidity. These changes occur, in the main, during the first 10 days. Coliform bacteria and lactobacilli, particularly the latter, are considered to be mainly responsible for the acid formation. Certain anaerobes may develop after several days, the extent of their development depending upon the residual carbohydrate and protein and the restraining effect of acidity. Micrococci, yeasts, and aerobic spore-formers normally contribute only to a limited extent to the general chemical break-down.

The effect of the addition of various materials and bacterial cultures to grass silage at the time of making on the subsequent bacterial and chemical changes, L. A. ALLEN, S. J. WATSON, and W. S. FERGUSON (*Jour. Agr. Sci. [England], 27 (1937), No. 2, pp. 294–308*).—As an outgrowth of the above study, trials were conducted in which the effect of adding to grass silage dried whey, fresh whey, solutions of dried whey, and solutions of molasses, each inoculated with lactobacilli, solutions of dried whey alone, and mineral acids was determined. The additions of whey and molasses resulted in a high lactic acid content and the production of silage of excellent quality and digestibility. Fresh whey was less satisfactory than solutions of concentrated or dried whey because of the large amount of water contained in the former and also because of the chance of introducing a large mixed bacterial flora which may develop in a way detrimental to the predominance of lactic acid fermentation. Molasses proved a suitable source of carbohydrates, and subsequent development of lactobacilli may be further insured by inoculating the molasses with a suitable culture.

The nutritive value and mineral deficiencies of soybeans, C. L. SHREWSBURY and C. M. VESTAL (*Indiana Sta. Bul. 420 (1937), pp. 25*).—The results of 10 experiments are reported in which identical rations were fed simultaneously to pigs and rats. In the first four experiments, designed to study the effect of various protein supplements and also a vitamin B supplement on the nutritive value of a basal corn, raw soybeans ration, it was found that the addition of such supplements as tankage, meat scrap, or casein resulted in a marked increase in the growth-promoting properties of the ration. However, such protein supplements apparently corrected the deficiencies of corn, as no evidence was obtained to indicate that the deficiencies of soybeans as a protein supplement to corn could be corrected by adding other proteins to the ration. The corn-soybean ration did not prove to be deficient in vitamin B. Experiments 5 and 6, dealing with the effects of heat treatment on the nutritive value of soybeans, gave evidence that either steaming or roasting the soybeans brought about a change which made them an excellent protein supplement to corn. Experiments 7 to 10 tested the effects of various mineral supplements on the corn-soybean or corn-soybean-casein-yeast ration and also the comparative effects of a ground limestone-superphosphate supplement on rations of corn plus soybeans in the raw, cooked, or roasted condition or soybean oil meal. No mineral mixture produced satisfactory gains on the corn-raw soybean diet, although the bone structure was favorably influenced. With hogs the effect of mineral additions was most pronounced on the roasted soybean ration, although beneficial on all rations. The response of rats to mineral additions was much more marked than for hogs.

Cocoa husks as a feeding stuff [trans. title], K. RICHTER and H. BRÜGGEMANN (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 2, pp. 184–188; Eng. abs., p. 188*).—Digestion trials with four wethers in which cocoa husks were

fed as a supplement to meadow grass indicated average digestibility coefficients of 27.4, 34.5, and 82.9 percent for the crude protein, crude fiber, and nitrogen-free extract, respectively, in the husks. True protein proved to be indigestible. A starch value of 53 kg per 100 kg of dry matter is ascribed to the husks.

The feeding value of wood sugar yeast [trans. title], K. Richter and H. Brüggemann (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 2, pp. 95–105; Eng. abs., p. 105*).—Metabolism trials with pigs and wethers indicated that the wood sugar yeast tested contained over 46 percent of digestible crude protein, over 40 percent of digestible pure protein, and starch values in excess of 76 kg per 100 kg of feed. It is concluded that this product should be classed in the series of valuable protein feeding stuffs.

Commercial feeding stuffs, H. R. Kraybill et al. (*Indiana Sta. Circ. 228 (1937), pp. 32, fig. 1*).—This is the condensed report of commercial feed inspection for 1936 (E. S. R., 75, p. 821), including 3,084 samples examined microscopically and 2,864 analyzed chemically.

Commercial feeding stuffs, L. S. Walker and E. F. Boyce (*Vermont Sta. Bul. 416 (1937), pp. 40*).—This is the usual report of the analyses for protein, fat, and fiber of 2,216 samples of feeding stuffs collected for official inspection during December 1936 (E. S. R., 76, p. 670).

***Interpretation of variations in plant composition in relation to feeding* value**, L. A. Maynard (*Jour. Amer. Soc. Agron., 29 (1937), No. 6, pp. 504–511*).—This is a brief review of the energy, protein, mineral, and vitamin requirements of herbivorous farm animals and the relative efficiency with which different types of plant materials may be expected to meet these requirements.

Recent developments in minerals and vitamins for farm animals, L. A. Maynard (*Cornell Vet., 27 (1937), No. 2, pp. 122–129*).—This is a review of recent findings in these important fields of animal nutrition.

Sulphur metabolism, II–IV, J. H. Kellermann (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 7 (1936), No. 1, pp. 189–224*).—This series of studies is continued (E. S. R., 75, p. 820).

II. *The distribution of sulphur in the tissues of rats fed rations with and without the addition of elementary sulphur* (pp. 189–197).—The distribution of sulphur in the tissues of three groups of rats is reported. One lot received a control basal diet; the second lot the basal diet plus 0.8 perent of elementary sulfur; and the third lot the basal diet, 0.8 percent of sulfur, and orange juice ad libitum. Sulfur feeding markedly increased the total sulfur content of the lung and spleen and to a lesser extent of the heart and kidney. Slightly less sulfur was stored in the tissues of the group receiving orange juice. The sulfur feeding had little effect on the sulfate content or the concentration of volatile sulfides in the tissues.

III. *The effect of flowers of sulfur on the growth of young rats fed an otherwise well-balanced ration* (pp. 199–207).—The effect of flowers of sulfur on the growth of rats maintained on two types of basal diets, one a low protein diet and the other an optimum diet, was studied. Adding 0.8 percent of sulfur to the low protein diet which was also low in cystine and "food sulfur" caused a marked retardation of growth, while additions of sulfur up to 3.5 percent in the complete diet had little toxic effect. It appears that rations complete in all respects, with optimum levels of protein and food sulfur, possess greater antitoxic effect to sulfur poisoning than rations which are low in these constituents.

IV. *The oxidation and reduction of elementary sulfur by animal tissues in vitro* (pp. 209–224).—In these studies with various beef tissues it appeared that all protein tissue was capable of reducing sulfur to hydrogen sulfide. Acids

inhibited this reaction, whereas alkalies and alkaline salts enhanced it. Also acids inhibited and alkalies and alkaline buffers increased the oxidation of reduced sulfur to sulfates. Apparently all tissues in the animal organisms should be able to oxidize sulfides.

The minimum vitamin A and carotene requirement of cattle, sheep, and swine, H. R. Guilbert, R. F. Miller, and E. H. Hughes (*Jour. Nutr., 13 (1937), No. 5, pp. 543–564*).—Supplementing a previous report on the carotene requirements of cattle (E. S. R., 74, p. 527), information is presented on the requirements of swine and sheep for carotene as supplied by alfalfa hay and by solutions of carotene crystals in cottonseed oil and also on the requirements of cattle, swine, and sheep for vitamin A as supplied in cod-liver oil. The night-blindness test and a check on storage either by depletion or by the antimony trichloride test on extracts of the liver tissue were used as the criterion of sufficiency.

The amount of vitamin A or carotene daily which just prevented night blindness apparently represented a physiological minimum. The minimum carotene requirement was found to be of the same order for these three species, namely, from 25 to 30 μg daily per kilogram of body weight, and the minimum vitamin A requirement was from 6 to 8 μg daily per kilogram of body weight for each species. This required level of intake is in close agreement with data on the rat reported from various sources, tending to support the previously expressed hypothesis that the vitamin A requirement of mammals is directly related to body weight rather than to their energy requirements. The data on cattle, sheep, and swine indicated that the minimum levels of carotene intake which prevent night blindness permitted only small storage in the liver, and these levels appeared to be subminimal for normal pregnancy since the calves or lambs from experimental animals were either born dead or were very weak at birth and died soon after. No storage in the livers of these calves or lambs could be demonstrated.

The vitamin content of the seed of blue sweet lupine, strain 411 [trans. title], A. Scheunert and M. Schieblich (*Biedermanns Zentbl., Abt. B, Tierernähr., 8 (1936), No. 1–2, pp. 132–135; Eng. abs., p. 135*).—Assay of the seed of an alkaloid-free strain of blue sweet lupine showed 1 g to contain 30 international units of vitamin A and 3 international units of vitamin B_1. The content of B_1 was relatively lower, corresponding to about that of the hay.

Cane molasses versus beet molasses as a source of vitamin B_6 and lactoflavin, P. György (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 2, pp. 167–169*).—This report, based upon feeding tests with rats, indicates that crude cane molasses is a good source of vitamin B_6 and also contains small amounts of lactoflavine, whereas beet molasses is practically devoid of both of these fractions.

Gastro-intestinal motility in the ruminant, H. H. Dukes and J. Sampson (*Cornell Vet., 27 (1937), No. 2, pp. 139–149*).—The New York State Veterinary College has studied the gastrointestinal motility in anesthetized sheep by the open-abdomen saline-bath method. Limited information could be gained regarding the motility of the rumen, reticulum, and omasum, although certain types of motility of the rumen and reticulum are described which cannot be determined in the fistula method of study. Spontaneous contractions of the omasum were not observed. Good results were obtained on the type of motility of the abomasum and the large intestines and fair results from the small intestines, and these are fully described.

The variation of the nitrogen and ether extract contents in the rumen during digestion, with reference to a possible fat synthesis through action

of the rumen flora [trans. title], F. W. Krzywanek and G. Quittek (*Biedermanns Zentbl., Abt. B, Tierenähr., 8 (1936), No. 1–2, pp. 136–147; Eng. abs., p. 147*).—This study was conducted with sheep, employing a rumen fistula technic. The percentage of moisture and also the percentage of nitrogen and crude fiber in the dry matter of the rumen content was found to increase as the length of the digestion period in the rumen increased. Increased moisture was attributed to the constant secretion of the salivary glands, and increased nitrogen and fat in the dry matter resulted mainly from the fermentation of the carbohydrates present. The iodine number of the crude fat in the rumen remained constant during digestion, indicating that no change in fat structure occurred. The ratio of crude fat to nitrogen after 3, 6, and 9 hr. of rumen digestion as compared with their ratio in the ration showed a slightly decreasing ratio with increase in the length of the digestion period. Neither a decrease nor the removal of infusoria from the rumen content caused a reduction in the fat: nitrogen ratio, indicating that the infusoria had little or no influence on the crude fat present.

The effect of different nitrogen-bearing compounds of nonprotein nature (amide) on the nitrogen balance in ruminants: Trials with glycocoll, urea, and ammonium acetate [trans. title], K. Nehring (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 1, pp. 79–94; Eng. abs., p. 94*).—Metabolism trials were conducted with wethers in which one-third of the basal hay ration was replaced by a simple nitrogen-bearing compound and potato flakes, the substitutions being made at such levels as to provide equivalent total nitrogen contents. Data are reported on nitrogen balance, sulfur balance, and the content of different nitrogen fractions in the urine. The nitrogen balance was favorably affected by the presence of amides in the diet. Negative nitrogen balances which occurred during the basal and deficiency feeding periods were changed to positive balances when amides were fed. Ammonium acetate gave most favorable results in this respect, urea gave somewhat less favorable results, and glycocoll was the least effective of the nitrogen compounds tested. In general sulfur balances nearly paralleled the nitrogen balances. These results indicated that a part of the nitrogen in the ration of ruminants may be satisfactorily supplied by simple organic or inorganic nitrogen compounds.

Beef cattle production in the Blackland area of North Carolina, J. E. Foster, E. H. Hostetler, and L. I. Case (*North Carolina Sta. Bul. 310 (1937), pp. 14, figs. 4*).—Native and grade Hereford cows and their calves were turned on reed pasture May 1 of each of the three years included in this study. The cows were maintained on this pasture until January 1, then allowed to glean corn and soybean fields until March 15, then grazed on rye pasture and fed corn, cottonseed meal, and native roughage until May 1. The calves were weaned on November 20, wintered on cornstalk gleanings and rye pasture, with limited feeding of cottonseed meal, corn, and native roughage. As yearlings they were grazed on reed and tame pasture from May 1 to November 15, then finished in dry lot on a full feed of corn, cottonseed meal, soybean hay, and corn stover until April 15 when they were disposed of for slaughter. Under this system the net annual cost per cow was calculated to be $12.60 per year, divided as follows: Winter feed cost 56 percent, labor 12, interest on cattle 11, summer pasture 9, equipment 7, and all other costs 5 percent. Of the average gain of 726 lb. made between the time calves were 2 mo. old and the time they were finished for market approximately 30 percent was made before weaning, 32 percent between weaning and the time they were placed in feed lot, and 38 percent in the feed lot. The average cost per hundredweight of native

weaned calves, yearling stockers, and finished 2-year-olds was $6.00, $4.53, and $6.13, respectively, and for the grade Herefords $5.64, $4.30, and $5.66, respectively.

Other data regarding feed consumption, economy of gain, and market grade of these animals have been previously noted (E. S. R., 77, p. 82).

A grazing adventure in northern Minnesota, M. J. Thompson (*Duluth: Minn. State Emergency Relief Admin., [1935], pp. [51], figs. 10*).—This is an extensive report of the Minnesota S. E. R. A. emergency pasturage project conducted in northern Minnesota from July 23 to December 31, 1934, in which approximately 52,000 head of cattle were moved from the drought area into nine counties in northeastern Minnesota. Statistical records are presented on the number of cattle received, the number and percentage recovered, and causes of losses by herds and by counties, with a comparison of the effectiveness of the various pasture types involved. Discussion includes claims, gains and losses, costs, thievery, local reactions, and permanent values of the project. Included are the conference findings on the emergency pasture survey.

The use of native grass in producing finished cattle, M. L. Baker (*Nebraska Sta. Bul. 307 (1937), pp. 16, figs. 3*).—This is a report of a series of steer feeding trials in which full-feeding of steers on alfalfa hay and corn throughout the finishing period was compared with full-feeding, limited feeding, and no feeding of corn to steers on native pasture (average 79 days), each followed by full-feeding of corn and alfalfa in dry lot. At least three trials were conducted with each type of feeding. Steers full-fed on pasture and finished in dry lot made practically the same gains and were of equal market desirability as those full-fed throughout in dry lot. It is indicated that when 1 ton of alfalfa hay is worth more than 5.3 bu. of corn and 8 mo. of pasture for one steer, the pasture-feeding method will yield more economical gains. Steers receiving a limited amount of corn (average 7.74 lb. per head daily) on pasture made definitely cheaper gains than those receiving a full feed (average 14.38 lb.) on pasture, and there was no apparent difference in the market desirability of the two lots. The limited-fed steers required approximately 4 weeks longer feeding than the lot full-fed on pasture. Steers receiving no grain on pasture made cheaper gains and sold as well as those receiving limited grain. However, slaughter data showed that they were not as well finished, and it is suggested that a 6 to 8 weeks longer finishing period would be required to attain the same degree of finish. Since the limited- or no-grain-fed groups required a longer finishing period they make larger total gains and should be lighter in weight at the start of the grazing season if all cattle are to be marketed at approximately the same weight. A chart is presented for estimating the cost of gain under the three systems of feeding on pasture with a range in prices of corn and alfalfa hay.

Nitrogen balance of cattle receiving urea and a urea-potato flakes mixture as protein substitutes [trans. title], E. Mangold and H. Stotz (*Landw. Vers. Sta., 127 (1936), No. 1–2, pp. 97–118*).—Nitrogen balance trials were conducted with two bull calves on a basal ration of hay and soybean meal and with 25 percent of the digestible proteins in the basal ration replaced by equivalent amounts of nitrogen as urea or as a proprietary mixture of urea and potato flakes. The nitrogen balance was unaltered by substituting urea in the ration and was slightly increased when the urea-potato flake mixture was fed. The food deficiencies of the urea could not be determined from the results of these trials.

Afrikaner cattle: Breed history and Standard of Excellence, T. G. W. Reinecke (*Farming in So. Africa, 12 (1937), No. 133, pp. 149–152, figs. 3*).—This

article discusses the history and present status of the Africander breed of cattle and sets forth the recently adopted Standard of Excellence.

[Thirteenth and fourteenth annual reports of the activities of the National Live Stock and Meat Board for the fiscal years 1935–36 and 1936–37], R. C. POLLOCK (*Natl. Livestock and Meat Bd. Ann. Rpts., 13 (1936), pp. 112, figs. 55; 14 (1937), pp. 112, figs. 58*).—These reports (E. S. R., 73, p. 825) contain accounts of investigations on meat nutrition and the quality and palatability of meat, including progress reports of the cooperative meat investigations being conducted by the several State experiment stations and the U. S. Department of Agriculture.

Chilled beef carriage: Preventing ice formation by electricity (*Cold Storage, 40 (1937), No. 468, p. 65, fig. 1*).—This note describes a method for preventing ice formation in chilled beef during transit at 29.5° F. by placing electrodes in the upper and lower ends of each suspended quarter so that electric current from any suitable source may be passed through the quarters. It is stated that beef in transit for 21 days arrived in an entirely satisfactory condition.

Sheep nutrition, I, II, H. E. WOODMAN, R. E. EVANS, and A. EDEN (*Jour. Agr. Sci. [England], 27 (1937), No. 2, pp. 191–223*).—Two reports are presented from the School of Agriculture, Cambridge.

I. *Measurements of the appetites of sheep on typical winter rations, together with a critical study of the sheep-feeding standards* (pp. 191–211).—In a series of feeding trials with sheep subsisting outdoors on typical winter rations, the appetite of a 100-lb. sheep measured in terms of dry matter intake was found to be slightly over 20 lb. per week. The maintenance requirement is tentatively established at 9 lb. of starch equivalent and 0.38 lb. of digestible protein per week. A summary of the Wood feeding standard for sheep and the authors' revision of it are presented.

II. *Determinations of the amounts of grass consumed by sheep on pasturage of varying quality* (pp. 212–223).—In this phase of the study the feces voided by sheep on pasture were collected in special waterproof bags attached to the hindquarters by a light webbing harness, and weight determinations were made. During the same period the digestibility of the herbage was determined in independent trials with other sheep. With this information the mean daily grass consumption of each sheep was calculated. The results indicate that sheep consume a greater quantity of dry matter when on pasture than when on a typical winter ration, one group consuming from 80 to 88 percent of the amount predicted by the Wood standard on winter rations and from 104 to 117 percent of the predicted amount when on pasture.

Relation of certain dietary essentials to fertility in sheep, G. H. HART and R. F. MILLER (*Jour. Agr. Res. [U. S.], 55 (1937), No. 1, pp. 47–58*).—The California Experiment Station has conducted experiments to determine whether any particular dietary essential is necessary for high fertility in sheep or whether the problem is one merely of total energy intake. During the course of the four trials reported the effect of low vitamin A intake, low protein intake, and low phosphorus intake was studied.

When ewes were in good condition and had large stores of vitamin A in their livers, a low vitamin A intake for 5 mo., including the breeding season, did not significantly reduce the number of lambs born as compared with the control animals receiving vitamin A above minimum requirements during the breeding season. With similar ewes, limiting the protein intake over a 4-mo. period, including the breeding season, had little effect on the number of lambs produced. When ewe lambs were restricted to a low vitamin A in-

take they were not depleted of vitamin A stores at breeding time, but continuation of the deficient diet during gestation led to depletion of vitamin A storage after about 9 mo. on the ration, and most of the lambs born were weak and died soon after birth. In the final trial when ewes were depleted of vitamin A to the point of night blindness at breeding time about 65 percent of the ewes conceived, but gestation was unsuccessful and all the lambs were born dead or died within 24 hr. Ewes on a low protein, low phosphorus diet were more severely affected and produced a markedly lower percentage lamb crop than ewes on a low protein intake alone, although the low phosphorus ration supplemented with cod-liver oil did not lead to depletion of the blood phosphorus.

The influence of quantity of feed on the growth and properties of wool, J. C. Swart (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 36 (1936), No. 2, pp. 197–226, figs. 57; Ger. abs., pp. 224–226*).—In this study conducted at the University of Stellenbosch, Union of South Africa, two groups of six Merino wethers each were employed. A typical hay-grain ration was fed, one group at a level considerably above maintenance and the other at a slightly submaintenance level. A study of the relationship between live weight gains and average total weight of grease wool, average staple length, average number of crimps per inch, and average diameter of fibers led to the following conclusions: (1) Increased feed consumption as indicated by increased body weight results in an increase in fleece weight; (2) Merino sheep on a submaintenance ration will grow wool at the expense of body maintenance; (3) increase in body weight is accompanied by an increase in staple length (coefficient of correlation=0.717±0.147), back wool being more sensitive to an increased ration and less sensitive to a decreased ration than britch wool; (4) increase in body weight is negatively correlated to the number of crimps per inch of fiber from shoulder, back, and britch samples (coefficient of correlation=—0.723±0.144); and (5) increase in body weight is accompanied by an increase in average diameter of fibers (coefficient of correlation=0.604±0.192). Fiber diameters for a given body area vary less on the lower plane of feeding. The order of variability in fiber thickness ranging from greatest to smallest usually is britch, back, belly, and shoulder.

Peanut hay as feed for sheep, C. T. van Rensburg (*Farming in So. Africa, 12 (1937), No. 134, pp. 197, 202, figs. 4*).—Brief trials comparing the feeding value of peanut hay and cowpea hay for ewes and lambs are reported. The peanut hay proved palatable, and the live weight gains of both ewes and lambs receiving it slightly exceeded the gains in the cowpea hay-fed groups.

The wintering of ewe hoggs, A. H. H. Fraser (*Scot. Jour. Agr., 20 (1937), No. 2, pp. 166–172*).—Comparative trials in wintering ewe lambs on the native hill pastures and in the lowlands indicated that, because of the high percentage mortality and the risk of permanent stunting and development of undesirable conformation, wintering the lambs on the hill pastures was unsatisfactory. Experiments in feeding mineral supplements and protein and carbohydrate feeds in economic quantities showed that these practices were not a satisfactory substitute for wintering in the lowlands.

Producing native lambs: Rations for ewes suckling lambs, 1930–1931–1932, C. Harper (*Indiana Sta. Bul. 419 (1937), pp. 15*).—The experiment reported has as its object a comparison of the relative values of various rations in producing milk from ewes as measured by the gains and finish of the lambs while they were suckling their mothers. Four lots of approximately 20 grade western ewes each were employed in each of the three seasons. The rations fed the ewes in lot 1 were whole oats and early-cut

timothy hay; lot 2, whole oats and good quality clover hay; lot 3, shelled corn and good quality clover hay; and lot 4, whole oats, cottonseed meal, and good quality clover hay. The lambs were all sired by purebred Shropshire rams, and all were fed exactly alike, receiving shelled corn and clover hay in creeps in addition to milk received from their mothers.

Good quality clover hay proved more efficient than the early-cut timothy hay in the ewe ration. The lambs made slightly greater average daily gains and the ewes lost less weight during the suckling period and produced somewhat more wool. There was little difference between shelled corn and oats as a grain feed for ewes. There was no essential difference in average gain of the lambs or in loss of weight of the ewes, and only a slightly greater wool clip in favor of the oats ration. The addition of cottonseed meal to a ration of oats and clover hay improved its value, resulting in greater gains and better finish of the lambs and decreased weight losses of the ewes, with no essential difference in wool clip from the two lots. It is suggested that, because of the small differences in favor of the supplemental ration, the quality of the grain and roughage available should have a bearing on whether to feed a protein supplement in the winter ration of ewes.

Effect of acid silage on the metabolism of sheep and pigs, with special reference to sulfuric acid as an acidifying agent [trans. title], W. KIRSCH and F. GRAMATZKI (*Ztschr. Zücht., Reihe B, Tierzücht. u. Züchtungsbiol., 36 (1936), No. 1, pp. 101–107*).—Digestion and balance trials with a wether receiving grass and clover silage plus 0.5 percent of sugar over a 9-day experimental period and on a similar silage ration in which the sugar was replaced by 10 equivalents of sulfuric acid per 100 kg of silage plus 5 g of calcium carbonate daily over a second 9-day period indicated that the digestibility and starch equivalents of the two rations were similar, and that the substitution of acid for sugar had only a slight effect on the nitrogen, calcium, and phosphorus balances. Similar trials with a boar indicated that 0.5 percent of sugar in a basal ration of potatoes, crushed barley, and fish and meat meal could be replaced with a mixture of hydrochloric and sulfuric acid either with or without additions of calcium phosphate without altering the nutritive value of the ration.

Recent advances in pig breeding and fattening in Sweden [trans. title], N. PETERSEN (*Ztschr. Schweinezucht, 43 (1936), No. 36, pp. 571–573*).—The methods employed and the results obtained at the Swedish pig-litter testing stations are summarized. In comparing the Swedish Landrace and Large White Yorkshire breeds the Landrace showed more rapid growth and lower feed consumption, but the Large White showed smaller loss at slaughter and also a higher percentage of high-grade pigs with thinner back fat, thicker belly, and somewhat greater body length.

Different methods of pig fattening in Sweden [trans. title], N. PETERSEN (*Ztschr. Schweinezucht, 43 (1936), No. 40, pp. 632–636, figs. 3*).—This article presents pig-feeding standards as adopted in Sweden and also reports the results of pig-feeding experiments in which four groups of pigs were fed at the following levels during the growth and fattening periods: (1) Standard throughout, (2) standard up to 50 kg of live weight and full-fed thereafter, (3) full-fed throughout, and (4) standard up to 50 kg of live weight and 10 percent reduction thereafter. The average daily gains were 0.613, 0.623, 0.637, and 0.592 kg and the feed units per kilogram of gain were 3.82, 3.92, 4.04, and 3.74 for the respective lots. Slaughter losses were practically identical for all groups (from 25.3 to 25.7 percent).

The use of wood sugar in pig fattening [trans. title], STAHL (*Ztschr. Schweinezucht, 43 (1936), No. 30, pp. 471–473*).—Wood sugar, prepared by the action of acid on wood, distilling off the liquid, and neutralizing with chalk, was shown to have a rather high feeding value in digestion trials with pigs and wethers. Replacing one-sixth of the barley with the sugar in a barley-fish meal ration for pigs did not decrease the value of the ration, and one-third of the potato flakes could be replaced by wood sugar when pigs received potatoes ad libitum in addition to a basal barley-fish meal ration. Pigs on the wood sugar rations yielded firm carcasses of good color.

Chronic zinc-poisoning of pigs: Results of experimental feeding of pure zinc lactate, R. E. R. GRIMMETT, I. G. MCINTOSH, E. M. WALL, and C. S. M. HOPKIRK (*New Zeal. Jour. Agr., 54 (1937), No. 4, pp. 216–223, figs. 3*).—On feeding for 2 mo. approximately 0.1 percent of zinc as zinc lactate in the milk with a small amount of meal, three young weanling pigs showed a stiffness in action, a roughness of coat, and a reduced feed intake. A few days later they became quite lame. Analysis of the blood at this time revealed a normal calcium and phosphorus content. All pigs were slaughtered soon after lameness occurred. Post-mortem examination revealed an apparently normal alimentary tract. Damage to the liver was observed in one case and some damage to the kidneys in all cases. Examination of the long bones showed that the humerus was badly damaged in each instance, the cartilage having lifted off a spongy underlying bone, with some erosion and considerable fluid in the humeroradial joints. This nonspecific arthritis apparently was produced by an upset of mineral metabolism resulting from prolonged zinc feeding.

Carcass-quality in bacon pigs, I, II, C. P. MCMEEKAN (*New Zeal. Jour. Agr., 54 (1937), Nos. 3, pp. 147–158, figs. 5; 4, pp. 223–231, figs. 3*).—Two studies are reported by the Massey Agricultural College.

I. *New Zealand bacon pigs in relation to United Kingdom market requirements*.—Study revealed that shortness in length of loin and a tendency toward overfatness were the most serious weaknesses. A comparison of carcass quality score for Large White, Tamworth, and Large Black purebreds, and Tamworth × Berkshire, Tamworth × Large White, Tamworth × Large Black, and Large White × Berkshire cross-breds showed that, while there was little difference in carcass quality score as a whole for the different lots, they did vary significantly in efficiency with respect to individual quality points. These differences within each breed and cross-bred lot indicated the possibilities of developing suitable bacon strains through selection.

II. *The influence of supplementary concentrates on carcass-quality*.—Feeding tests were conducted with approximately 100 pigs divided into groups, each lot receiving factory buttermilk ad libitum, while supplementary grain feeding ranged from none to 2 lb. per 100 lb. of live weight daily. There was no evidence that buttermilk alone produced abnormally thin bellies or that the addition of meal increased the thickness of belly. Additions of meal to the buttermilk ration increased the proportion of fat in the carcass, although this difference was not marked when grain feeding did not exceed 1 lb. per 100 lb. of live weight daily. The fat of all pigs on such rations was particularly hard. The type of pigs had a greater influence than the type of diet on the proportion of fat to lean in the bacon carcass.

Pork production, W. W. SMITH (*New York: Macmillan Co., 1937, rev. ed., pp. XXII+575, figs. 88*).—This revised edition (E. S. R., 44, p. 571) has summarized the available results of experimental studies, but has retained the original outline of subject matter and plan of presentation.

The influence of salt on the nitrogen balance of hens, J. S. WILLCOX (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 2, pp. 121–134, figs. 5; Ger. abs., p. 134*).—In a nitrogen balance experiment conducted at the University of Leeds with four Rhode Island Red hens, a well-balanced basal ration containing no salt was compared with the same ration plus 1 percent of salt. Variations in nitrogen consumption and retention from day to day apparently were not conditioned either by egg laying or by loss of nitrogen in feathers due to molting. The addition of 1 percent of salt to the ration exerted a favorable effect on total feed and nitrogen consumption, but there was no conclusive evidence that its presence enhanced the nitrogen retention.

Methods and rations for fattening poultry, H. S. GUTTERIDGE (*Sci. Agr., 17 (1937), No. 6, pp. 340–358; Fr. abs., p. 358*).—This study conducted at the Central Experimental Farm, Ottawa, consisted of two major phases, first, the conducting of actual fattening trials with poultry and, second, the consideration of criteria suitable for judging the ability of a feed to fatten. Two 21-day fattening trials are reported, one with White Leghorn capons and the other with Barred Plymouth Rock cockerels, involving in all 10 feeding trials and one matter of feeding technic. The method of allotting birds to the various groups, the actual technic of feeding and management, the sampling of tissues for chemical analyses, the chemical analyses, and the biometrical treatment of the data are each fully discussed.

It is concluded that (1) the feeding of a fattening mash in dry form with skim milk to drink and both before the birds constantly gave inferior weight gains as compared with feeding the same mash moistened with twice its weight of skim milk and fed twice daily for 30-min. periods; (2) pen feeding was less efficient than crate feeding; (3) potatoes whether raw or cooked were unsatisfactory as a supplement to the wet mash ration; (4) ground yellow corn with skim milk was much more efficient than ground wheat with skim milk or a mixture of 2 parts of ground oats and 1 part of ground barley with skim milk; (5) 10 percent of meat meal proved a valuable supplement to a mixture of 2 parts of oats and 1 part of barley; and (6) 15-min. feeding periods proved as efficient as 30-min. periods.

Weight gains in dressed poultry did not seem to be a satisfactory indication of the efficiency of a feed or treatment to increase fat. The percentage of fat in tissues at the end of a fattening period may be a poor criterion of fat increase during an experiment because of undetermined variations in degree of fatness of different breeds at the beginning of a trial. The distribution of body fat is unimportant as a criterion for the fattening efficiency of a feed. Methods are suggested for adjusting weight gains to compensate for variations in initial weight and in feed consumption.

The effect of certain calcium intake levels on hatchability and egg shell formation (*Rhode Island Sta. Rpt. [1936], pp. 38, 39*).—When mash rations containing 1.99, 2.93, and 5.2 percent calcium without oystershell and 1.46 percent calcium plus oystershell ad libitum were fed to laying hens the average calcium content of the eggshells was 1.57, 1.69, 1.79, and 1.96 g, respectively.

The hatchability of chicken eggs as influenced by environment and heredity, W. LANDAUER [*Connecticut*] *Storrs Sta. Bul. 216 (1937), pp. 84, figs. 21*).—This is a comprehensive summary based on a critical examination of the whole field and presents not only the results of investigations at the station but also a general review, including a great deal of data from other sources. In successive sections of the bulletin are discussed the physical environment of hatching eggs, the chemical environment during incubation, egg traits which influence hatchability, nutrition, age and reproductive activity of parent

stock and metabolism of laying hens as factors in hatchability, genetic factors affecting hatchability, and embryonic development and hatchability. An extensive bibliography is appended.

Meat scraps and dried milk in rations for starting chicks, R. E. Roberts and C. W. Carrick (*Indiana Sta. Bul. 421 (1937), pp. 27, fig. 1*).—The results of four series of experiments are reported. In all cases either Barred Plymouth Rock or Single Comb White Leghorn chicks were used. They were placed in experimental pens at from 24 to 48 hr. of age, and in most cases the trials extended over a 10-week period. The mixed rations were fed as a dry mash and kept before the chicks at all times, and water was provided ad libitum.

In the first experiments, designed to determine the optimum amounts of protein supplements to be used in the rations, it was found that 15 percent of meat-and-bone scrap and 5 or 6 percent of dried milk produced more rapid growth and the amount of feed required per unit of gain was less than when 12 percent of meat-and-bone scrap and 4 percent of dried milk were fed. The higher rate of gain was, however, approximately offset by the increased cost of the ration. No differences in mortality could be attributed to the type of ration.

In a study of the optimum proportion of meat-and-bone scrap and dried milk in the ration, ratios of 3:1, 1:1, and 1:3 were maintained. At these levels no differences in rate of gain, mortality, or feed required per unit of gain were observed, and males and females were equally efficient in converting feed into gain.

A comparison of dried buttermilk and dried skim milk as supplements to the starting ration indicated little difference in their relative feeding value. A slight advantage in favor of dried buttermilk was of doubtful significance.

A comparison of dried milk and dried whey as supplements indicated that the dried milk was superior when the two were fed in equal amounts, but when fed at such levels as to provide equal amounts of protein they produced practically the same rate of growth. There was no difference in mortality or in feed required per unit of gain on the two rations.

The utilization of food elements by growing chicks.—I, A comparison of protein concentrates from animal and vegetable sources, C. W. Ackerson, M. J. Blish, and F. E. Mussehl (*Nebraska Sta. Res. Bul. 90 (1937), pp. 8*).—Two lots of 15 newly hatched White Rock chicks each were used in this study, the paired feeding technic being employed. A basal mixture made up 85 percent of each ration and mixtures of dried buttermilk, fish meal, meat scraps, and cornstarch 4.5:4.5:4.5:1.5 and soybean meal, corn gluten meal, wheat gluten meal, and tricalcium phosphate 7.5:3.38:3.38:0.75, respectively, comprised the remaining 15 percent of the rations. The two rations were very similar in chemical composition. The results were measured in terms of growth over a 60-day feeding period and comparative slaughter tests involving the determination of nitrogen, calcium, and phosphorus in the bodies of the chicks. The percentage rate of gain and the gain per gram of nitrogen fed were greater in the lot fed the animal protein concentrate. There was no difference between the lots with respect to calcium and phosphorus contents in the chick bodies, but the nitrogen content of the group receiving animal protein was somewhat greater. Nitrogen retention was somewhat higher on the animal protein diet, but calcium and phosphorus retention was lower than on the vegetable protein diet.

Differentiation between vitamin B_4 deficiency and "encephalomalacia" in growing chicks, C. A. Elvehjem, P. H. Phillips, and E. B. Hart (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 2, pp. 129–131, figs. 2*).—In a previous report (E. S. R., 71, p. 364) it was stated that a form of chick paralysis re-

sulting from vitamin B_4 deficiency in the ration was probably the same as that described by Pappenheimer and Goettsch.[2] This article describes and illustrates the type of chick paralysis due to vitamin B_4 deficiency (E. S. R., 76, p. 515) and also describes an encephalomalacia-like paralysis produced at the Wisconsin Experiment Station. The two forms are clearly differentiated, and the latter type appears to be very similar to that described by Pappenheimer and Goettsch.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Idaho], D. R. Theophilus (*Idaho Sta. Bul. 221 (1937), pp. 27–30, fig. 1*).—Results of dairy cattle studies are noted on the effect of the continuous use of sires proved for high production and acceptable type, pea germ meal as a source of vitamin E, the solids-not-fat content of milk as a heritable factor, and the reliability of selected tests for detecting mastitis.

Dairy products studies gave information on the relation of bacteria and enzymes to the development of wintery flavor in butter, and the effects of feeding alfalfa hay on the Reichert-Meissl and iodine values of butterfat.

[Investigations with dairy cattle and dairy products] (*Massachusetts Sta. Bul. 339 (1937), pp. 18–21, 23, 42, 44*).—Results are briefly noted on the effect of feeding a vitamin A concentrate on reproduction in cattle, by J. G. Archibald, V. A. Rice, and C. H. Parsons; the chemistry of pasture grass, by Archibald; and performance prediction from pedigrees, by Rice.

Dairy products studies reported include the influence of added iodine on the properties and bacterial flora of milk, by J. E. Fuller and G. S. Congdon; the effect of aging treatments on the Tyndall phenomenon of gelatin-water solutions, by W. S. Mueller; and the efficiency of water heaters, electric sterilizers, and electrically operated cooling tanks, by J. H. Frandsen, H. G. Lindquist, and M. Glickstein.

The influence of normal and extracted soybeans on milk production and quality of butter [trans. title], V. Horn and E. Mühl (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 1, pp. 1–31; Eng. abs., p. 31*).—In a series of trials with milking cows whole soybeans in a ration proved to be very palatable. When 35 percent of the concentrate check ration was replaced by soybeans an increase of 5.3 percent in milk yield and 5.6 percent in fat yield occurred, while little effect on the percentage of fat in the milk was noted. At this level of feeding the quality of the milk was not impaired but the quality of the butter was injured, resulting in a pronounced soybean flavor and soft body. The addition of 30 percent of palm kernel cake to the ration markedly increased the firmness of the butter. When 35 percent of extracted ground soybeans were included in the concentrate ration an increase of 4 percent in milk yield and 3.8 percent in fat yield occurred. The average percentage of fat in the milk was not changed. The butter had a desirable flavor and aroma, and the body was firm and hard without additions of palm kernel cake or feeds of a similar nature.

The influence of feeding untreated and disembittered vetch seed to cows on the yield and fat content of milk [trans. title], K. Richter and J. Herbst (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 1, pp. 32–38; Eng. abs., p. 38*).—Vetch seed (*Vicia sativa*), disembittered by steaming for 10 min. at from 95° to 105° C., was compared with untreated vetch seed in a double reversal feeding trial with nine milking cows when fed at the rate of 3 kg of

[2] Jour. Expt. Med., 53 (1931), No. 1, pp. 11–26, pls. 3, figs. 2.

air-dried seed per day. There were no significant differences in the milk yield or butterfat content of the milk produced.

The influence of feeding untreated and disembittered vetch seed on the composition and quality of milk, butter, and whipped cream [*trans. title*], F. Richter (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 1, pp. 39–51, figs. 2; Eng. abs., p. 51*).—A further study of the milk produced during the above-described feeding trial indicated that the composition and reaction of the milk was unaltered when the animals were changed from one type of ration to the other. Milk produced on the untreated vetch seed ration was better adapted for cheese making. When the animals were first fed the untreated seed the milk had a pronounced disagreeable odor and flavor. This condition persisted to some extent when the animals were changed over to the disembittered seed ration, but gradually disappeared and did not increase in intensity when they were again fed untreated seed. Butter flavors were adversely affected only during the first period on untreated seed. Butter produced on the untreated seed ration had a high degree of hardness but was somewhat softer when disembittered seed was fed. No specific differences in quality of whipped cream could be determined.

Feeding trials with vetch seed for milking cows [trans. title], H. Bünger, J. Schultz, and H. Augustin (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 2, pp. 106–114; Eng. abs., p. 114*).—Either untreated vetch seed or steamed vetch seed were used to replace a mixture of palm kernel cake and extracted ground soybeans in double reversal feeding trials with milking cows. The steamed seed proved somewhat more palatable than the untreated seed, but neither were observed to exert any deleterious effect on the animals. The untreated seed maintained approximately the same average milk production as the check ration, while production was slightly decreased with the steamed seed. It is concluded that up to 1.5 kg (3.3 lb.) of untreated vetch seed per cow daily can be safely fed.

Studies of vetch seed, with reference to the presence of toxic substances [trans. title], G. Schwarz and H. Finzenhagen (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 2, pp. 115–120; Eng. abs., p. 120*).—The presence of saponins could not be positively identified either in untreated or steamed vetch seed, but the untreated seed was found to contain about 0.05 g of prussic acid per 1,000 g of air-dried seed. Subjecting the seed to soaking and then steaming resulted in the removal of most of the prussic acid, and it is believed that by sufficient soaking and steaming it would be possible to extract it completely.

Feeding dairy calves with very limited quantities of whole milk [trans. title], L. Paloheimo (*Biedermanns Zentbl., Abt. B, Tierernähr., 9 (1937), No. 1, pp. 52–73, fig. 1; Eng. abs., pp. 72, 73*).—Trials were reported in which 190 Ayrshire calves were successfully raised to ages ranging from 90 to 120 days on very limited whole milk rations. The total quantity of whole milk fed was under 20 kg (44 lb.) in most cases. Other ingredients of the ration included limited amounts of skim milk, hay, either corn meal or ground oats, and small supplements of cod-liver oil. Live weight gains compared favorably with the "Eckles normal" for Ayrshire calves, and acute digestive disturbances were encountered in only two cases. Corn was considered a better concentrate than oats for young calves. Twenty-two calves raised by this method were maintained in the breeding herd and developed into cows of normal size and good producing ability.

Records, cows, and indexes, J. L. Lush (*Holstein-Friesian World, 34 (1937), No. 11, pp. 11, 12, 28*).—The Iowa Experiment Station has studied the

relationship between the first milk production records of cows and later records by the same individuals, i. e., the repeatability of records from one year to another. It was found that on the average differences between single records made in the same herds in Iowa Cow-Testing Associations are caused about 40 percent by permanent differences between abilities of the cows which made the records and 60 percent by environmental factors which vary from one lactation to the next for the same cow. The application of these findings to the computation of sires indexes is discussed.

Observations on the source of flavor in milk exposed for prolonged periods to radiation, K. G. Weckel and H. C. Jackson (*Food Res., 1 (1936), No. 5, pp. 419–426, fig. 1*).—The Wisconsin Experiment Station has ascertained the relationship existing between the constituents of milk and the development of activated flavor, using the same sources of radiant energy as previously noted (E. S. R., 77, p. 238). Three procedures were followed: First, the irradiation of fluid dairy products of different composition; second, the irradiation of constituents and fractions separated from milk; and, third, the separation of constituents and fractions from milk which had been previously irradiated.

The results indicate that the activated flavor resulting from irradiation is distinctly different from the commonly described oxidized flavor and that activated flavor originates in or is closely associated with the protein fraction of the milk. However, activated flavor may be present in the fat, probably due to absorption of such flavors by the fat. Albumin developed a more intense activated flavor than casein. The presence of activated flavor in the filtrates after the removal of casein and albumin was attributed to the effect of radiation on the soluble minor proteins and to absorption from the casein and albumin. Prolonged irradiation produced an altered flavor in milk exposed to the radiation transmitted through glass as well as through quartz, whereas milk constituents acquired an altered flavor when individually subjected to radiation transmitted through quartz, but not when the radiation was transmitted through glass.

The effect of fat content on oxidized flavor in milk and cream, C. T. Roland and H. A. Trebler (*Jour. Dairy Sci., 20 (1937), No. 6, pp. 345–350, fig. 1*).—Four experiments are reported in each of which a series of products was prepared by combining skim milk and cream (separated at 95° F.) from the stock milk in different proportions to give a range in fat content. Coils of copper wire of given surface areas were immersed in 100-cc lots of each product. The samples were then pasteurized, bottled, cooled, stored at 40°, and sampled after 24 and 48 hr. in storage.

The sensitivity of the standardized milks and creams to copper-induced oxidized flavor was shown to be definitely related to the fat content of the product, susceptibility increasing with increased fat content. A variation of 1 percent fat in the range of whole milk resulted in significant differences in flavor score. Skim milk samples exposed to large areas of copper failed to develop oxidized flavor. Milks made by recombining skim milk and cream were markedly less sensitive to copper-induced oxidized flavor than normal whole milk of like fat content. Bacterial examination of the samples showed no appreciable growth of micro-organisms during the experiment, indicating that bacterial activity was not a factor in decreased sensitivity. The removal of lecithin or related substances by the separator or changes in their distribution between the fat and aqueous phases are suggested as the cause for the decreased sensitivity.

Homogenization as a preventive of oxidized flavor, H. E. Ross (*Milk Plant Mo., 26 (1937), Nos. 4, pp. 36–39; 5, pp. 40–42, 44*).—This article from

the [New York] Cornell Experiment Station describes a series of experiments in which samples of whole milk and cream were subjected to homogenization at various pressures. In practically all cases the untreated control samples failed to develop oxidized flavor during the period of 96 hr. Running samples through the homogenizer at 0 pressure usually resulted in the development of a pronounced oxidized flavor. Homogenizing at 500 and 1,000 lb. pressure per square inch was partially effective in preventing the development of oxidized flavor but such treatments could not be recommended as satisfactory, whereas 1,500 lb. pressure proved very effective in preventing such flavors in either milk or cream. Efforts to produce oxidized flavor by soaking copper strips in unprocessed milk or cream and by adding various concentrations of copper sulfate to such samples invariably resulted in intense oxidized flavor. Similar treatment for milk and cream samples homogenized at 1,500 lb., with two exceptions, were protected against development of such flavors. Homogenization was wholly ineffective in destroying or reducing oxidized flavors once they had developed. The hypothesis is advanced that the prevention of oxidized flavor by homogenization may be due to the formation of a film around the fat globule.

Iodine in the milk (*Kentucky Sta. Rpt. 1936, pt. 1, p. 23*).—Trials in cooperation with Berea College are reported on the effect of adding kelp to the dairy ration.

Bacterial content of milk as affected by the use of different plating methods, A. BRADFIELD (*Vermont Sta. Bul. 417 (1937), pp. 54*).—The tryptone-glucose-skim milk agar formulated by Bowers and Hucker (E. S. R., 73, p. 837) was compared with standard agar both at incubation temperatures of 32° and 37° C., using normal types of both raw and pasteurized milks as well as milks heavily contaminated from specific sources. The modified medium gave higher average counts than the standard, and both gave markedly higher counts at 32° than at 37°, with greater increases resulting from the lowered incubation temperature than from change of medium. The modified medium at 32° gave a much higher percentage increase in count for pasteurized milk than for raw milk. Organisms derived from udders, feces, hair, or bedding grew practically as well on the standard as on the modified medium, while those derived from unsterile utensils, feed, and stable dust or those developing because of inadequate cooling grew in greater numbers on the modified medium and at the lower temperature. On the whole, the modified medium at 32° proved to be more accurate and consistent than the present standard method for estimating the numbers of bacteria in milk. A good quality milk will not be seriously penalized if this modified method is employed. Skim milk is considered an important constituent of these media, and readily soluble dry milk solids added with the other ingredients appear as effective as skim milk.

A partial report of this work was previously noted (E. S. R., 76, p. 385).

A statistical comparison of two methods for determining the bacterial count of milk, J. M. FRAYER (*Vermont Sta. Bul. 423 (1937), pp. 19, figs. 3*).—In this study the bacterial counts of 18 samples of milk as determined by the standard agar plate method and by use of the Bowers-Hucker medium (E. S. R., 73, p. 837) incubated at 32° C. for 48 hr. were compared. From 20 to 100 replicate plates were prepared from each sample, and each plate was counted from 3 to 6 times and by 3 different technicians, involving 4,709 counts in all. These data were then analyzed by simple statistical methods to show something of the relative value of each method for the purpose intended. It is concluded that the modified method produced a greater number of more luxuriant colonies. The modified medium because of its inherent opaqueness in-

creased the visibility, especially of the smaller colonies, so that counting accuracy was augmented. On the whole, it appeared significantly better adapted to the purpose than the present standard method.

Dyes and methods as they affect the methylene blue test, J. M. Frayer (*Vermont Sta. Bul. 424* (*1937*), *pp. 16*).—Three methods of conducting the methylene blue reduction test were compared, 50 to 100 replicate tests being made on each milk sample and involving in all 4,347 tests. In the first method the tubes were stoppered and protected from light and were not touched after being placed in the water bath until reduction was complete. In the second method the tubes were similarly handled but were carefully inverted once after 5 minutes' immersion in the water bath. In the third method the tubes were carefully inverted (not shaken) at 30-min. intervals in order to keep the fat and micro-organisms in more or less homogeneous dispersion. A statistical analysis of the data resulting from these methods indicated that the third method gave shorter and significantly more reliable reduction time than the other two, due primarily to more uniform bacterial dispersion brought about by the frequent inversion. A comparison of methylene blue thiocyanate and methylene blue chloride indicated that when used in approximately equal concentrations reduction times were very similar. Significantly longer reduction times elapsed when either dye was used in a concentration of 1:300,000 than when used at a concentration of 1:700,000.

Significance of the hemolytic streptococci found in milk, J. H. Brown (*Cornell Vet.*, *27* (*1937*), *No. 2*, *pp. 110–121*, *figs. 5*).—This report indicates that in the routine examination of milk for the presence of β-hemolytic streptococci likely to produce disease in man or mastitis in cattle, the simple procedure of inoculating sorbitol broth and hippurate broth with hemolytic colonies from blood agar plates will give a satisfactory test in over 99 percent of the cases. Strains which are both sorbitol-negative and hippurate-negative, i. e., that fail to ferment sorbitol or to hydrolyze the hippurate, are the types highly pathogenic to man. The sorbitol-negative hippurate-positive strains are the ones commonly causing mastitis in cows but are not pathogenic to man, and the sorbitol-positive hippurate-negative strains apparently nonpathogenic to man may cause mastitis. The sorbitol-positive hippurate-positive strains are considered nonpathogenic to man and are of doubtful significance in milk.

The genera Sporobolomyces and Bullera from the standpoint of dairy products, H. C. Olson and B. W. Hammer (*Iowa State Col. Jour. Sci.*, *11* (*1937*), *No. 2*, *pp. 207–213*, *pl. 1*).—Studies of the numbers of micro-organisms falling from the air in dairy plants (E. S. R., 72, p. 683) yielded certain organisms which discharged spores from colonies in such manner that when plates were inverted definite spots occurred on the covers directly beneath the colonies. By inverting acidulated malt agar or potato dextrose agar plates which had been exposed to the air over sterile malt agar plates a total of 32 cultures were isolated and studied. Twenty-six were identified as belonging to the genus *Sporobolomyces* and six to the genus *Bullera*, also one *Sporobolomyces* was isolated from fermented cream. The cultures included *S. salmonicolor*, *S. roseus*, a new species for which the name *S. pararoseus* is suggested, and *B. alba*. *S. pararoseus* is fully described, and the description of *B. alba* is extended. It is concluded that *Sporobolomyces* and *Bullera* organisms are unimportant in dairy products, either from the standpoint of the numbers present or the production of defects.

Why sweet cream is thick or thin, J. C. Hening (*Farm Res.* [*New York State Sta.*], *3* (*1937*), *No. 4*, *p. 7*).—This note briefly discusses the effect of the

percentage of butterfat, temperature, aging, and pasteurization on the thickness of sweet cream.

Age and fat per cent: The relation of butter fat percentage of the first lactation to that of subsequent lactations, C. W. TURNER (*Guernsey Breeders' Jour., 51 (1937), No. 10, pp. 924, 925*).—This study at the Missouri Experiment Station compared the butterfat percentage of the re-entry records of the Advanced Register Guernsey cattle with the butterfat percentage of the original entry record, a total of 5,847 pairs of 365-day records being included. The average test of the original entry record was 5.084 and of the re-entry records 5.066. The coefficient of correlation between entry and re-entry records was $+0.847\pm0.0527$. Over 80 percent of the pairs of fat percentages did not vary more than 0.5 percent, indicating that the change in fat content with age is very slight.

Churn loss factors and neutralization of cream, E. W. BIRD (*Amer. Creamery and Poultry Prod. Rev., 83 (1937), No. 19, pp. 698, 699*).—In discussing butterfat losses in churning it is indicated that greater fat losses occur in low testing cream than in higher testing cream, and the following formula,

$$\text{pounds of fat lost per 100 lb. churned} = \frac{(100-1.2\times\text{cream test})\times\text{buttermilk test}}{\text{cream test}}$$

is proposed for estimating churn losses of fat. Studies with cream which was pasteurized while sweet and then ripened indicated little change in fat losses for cream of a given fat content as the acidity increases within a pH range of 7.0 to 4.5. However, when sour cream is pasteurized and then neutralized the minimum fat losses occur at a pH of 6.75 to 7.0, with increases in fat loss as the pH varies in either direction. With regard to cream neutralization information is presented on the approximate pH resulting when various neutralizers are used to obtain a titratable acidity in cream of 0.25 percent. A close agreement was noted between the pH values of cream and of the resulting butter, with a tendency for the pH of the butter to be slightly higher than the cream. Butter scores were higher and tended to maintain themselves better in the pH range of 6.8 to 7.4 than at lower acidities.

A holding test at room temperature as an indication of the keeping quality of butter in storage, D. H. JACOBSEN (*South Dakota Sta. Bul. 308 (1937), pp. 35, figs. 2*).—In this study of the efficiency of a short-time holding test for predicting the keeping quality of butter in storage both unsalted and salted samples of each lot were tested.

When unsalted butter and butter serum therefrom were held at 21° more rapid and extensive flavor deterioration and more rapid increase in numbers of bacteria occurred in the serum than in the corresponding butter, but the serum was of little value in predicting keeping quality of the butter since the flavor defects were frequently quite different from those produced in the butter. Salted butter held for 7–10 days at 21° did not show flavor deterioration except for tallowiness, hence such a test gave no information for predicting the keeping quality of salted butter. Salt in butter (2.5 percent) effectively prevented the growth of lipolytic and proteolytic bacteria in both the butter and serum under the holding conditions of this experiment. Holding samples of unsalted butter for 7–10 days at 21° gave useful information on the keeping quality of such butter at lower temperatures. Bacterial counts of similar magnitude were reached after 2, 7, 21, and 56 days at 21°, 15°, 5°, and 0°, respectively. However, growth of bacteria at 21° was apparently not as much of a factor in flavor deterioration as the growth of similar numbers at lower temperatures because of the more extensive development of lipolytic

and proteolytic types at the lower temperatures. Flavor deterioration within 7–10 days at 21° invariably indicated flavor deterioration within 56 days at either 5° or 0°, but failure to show flavor defects at the higher temperature did not always insure good keeping quality at the lower temperature. The increase in the numbers of bacteria and flavor defects in unsalted, noncultured butter was much more extensive than in unsalted, cultured butter at similar temperatures. Rancidity and cheesy flavor in unsalted butter at 5° or 0° were frequently accompanied by large numbers of lipolytic and proteolytic bacteria, respectively, and both defects often occurred in the same sample.

A study of sugaring curds in the manufacture of Cheddar cheese, J. C. Marquardt (*Natl. Butter and Cheese Jour., 28 (1937), No. 10, p. 14*).—Trials at the New York State Experiment Station in which 0.75 percent of cane sugar was added to milled Cheddar cheesecurd just prior to salting indicated a consistent reduction in moisture content and improvement in body and flavor of the ripened cheese as compared with control lots from the same vats which did not receive sugar. The milk used in various trials ranged in quality from the types commonly used in cheese making to that suitable for fluid milk purposes. It is suggested that sugaring curds in making Cheddar cheese could well be introduced as a standard because of the moisture reduction and quality improvement.

Results of treating cheese milk or fresh curds with cured cheese, J. C. Marquardt (*Natl. Butter and Cheese Jour., 28 (1937), No. 11, pp. 20, 22*).—Trials were conducted at the New York State Experiment Station in which 1 percent of Limburger, 1 percent of Roquefort, or 0.25 percent of Sapsago cured cheese was added to cheese milk. In other trials 5 percent of Limburger, 5 percent of Roquefort, or 2.5 percent of Sapsago cheese was added to the freshly matted Cheddar curds. All cheeses were scored for body and flavor after 6-, 12-, and 18-week curing periods.

Adding the cured cheese to the milk did not significantly affect the scoring of the cheese. Flavor changes introduced by adding the Limburger or Roquefort were slight, but the addition of Sapsago produced a very desirable flavor characteristically different from the usual Cheddar cheese flavor. Adding Limburger or Roquefort cheese to the matting curd decreased the body and flavor score, while additions of the Sapsago to the curd had little effect on the score as compared with the control lots. It is concluded that cured cheese should never be matted with fresh cheesecurds in an attempt to modify cheese flavors.

Methods for the manufacture of smoked type cheese, J. C. Marquardt (*Natl. Butter and Cheese Jour., 28 (1937), No. 9, p. 10*).—Trials were conducted at the New York State Experiment Station in which varying amounts of liquid smoke (pyroligneous acid) were added to the cheese milk, to the whey after cutting, or to the curd of both Cheddar- and Provolono-type cheeses, and the effect on body and flavor of the resulting cheese was noted. Liquid smoke could not be satisfactorily added to the curds, but additions directly to the milk or to the whey were successful. Additions of 0.02 percent or less of the liquid smoke directly to the milk resulted in a desirable mild smoked flavor in Cheddar-type cheese. No more than 0.1 percent of liquid smoke could be used satisfactorily in the strong flavored cheeses. Additions of 0.01 percent of liquid smoke to processed cheese imparted a pleasant smoked flavor. The possibilities of commercial application of this process are indicated.

Observations on the salting of brick cheese, E. L. Byers and W. V. Price (*Jour. Dairy Sci., 20 (1937), No. 6, pp. 307–318, figs. 2*).—A brick cheese curd manufactured by a process previously noted (E. S. R., 74, p. 252) was used in

this study at the Wisconsin Experiment Station. Loaves of the cheese were subjected to various salting treatments, including dry salting (rubbing with dry salt once a day for 2 days) and brine salting (22-percent brine for 24, 48, and 72 hr. and 26-percent brine for 48 hr.). All cheeses were salted at 60° F. and cured for 2 weeks at 60° with 85 percent relative humidity, during which period the cheeses were rubbed and washed with a 2-percent salt solution every other day. Cheeses were paraffined at 14 days and placed in curing cellars at 40° temperature and 75 percent relative humidity. Acidity, moisture, and salt determinations were made at regular intervals, and all cheeses were graded.

Observations on the rate of salt penetration indicated that salt rapidly penetrated the outer layer, but about 8 weeks elapsed before the salt concentration was uniform throughout the cheese. As the salt content of any given portion of the cheese increased the moisture content decreased, the increased salt failing to account for the marked decreased moisture content. Cheeses subjected to 22-percent brine for 24, 48, and 72 hr. contained 38.9, 36.5, and 36.1 percent moisture and 1.9, 2.5, and 2.9 percent salt, respectively, at the end of 8 weeks' curing. Lots subjected to dry salting, 22-percent brine for 48 hr., and 26-percent brine for 48 hr. contained 36.1, 36, and 32.3 percent moisture and 1.4, 2.4, and 2.7 percent salt at the end of 8 weeks. It is concluded that long periods in the brine tank, highly concentrated brines, and early salting each increased the amount of salt in the cheese, and that dry salting was effective but less uniform than brine salting. Approximately 2-percent salt was considered an optimum content, excessive salting causing hard curdy body, white color, slow ripening, loss of yield, and delayed lactose fermentation, while low salt encouraged abnormal fermentation and caused weak body and open texture.

The influence of salt on the composition and quality of brick cheese, E. L. Byers and W. V. Price (*Natl. Butter and Cheese Jour., 28 (1937), No. 14, pp. 10, 12, 14, 16*).—This article presents essentially the same information as noted above.

Island of Orleans cheese, J. C. Marquardt (*Farm Res. [New York State Sta.], 3 (1937), No. 4, p. 8, figs. 2*).—This article describes a type of cheese which is manufactured almost exclusively on the Island of Orleans near the city of Quebec, Canada. The cheese, known in French as Le Fromage Raffiné de l'Isle d'Orléans, or more commonly Fromage Raffiné, is a soft cheese having a strong characteristic flavor. It is made from fresh cows' milk and contains over 50 percent moisture and about 25 percent fat. Yeasts and molds enter into the curing process, and the cheese is quite perishable, hence its sale is largely confined to the Quebec market. Certain unusual practices involved in its manufacture are discussed.

The gas requirements of molds.—I, A preliminary report on the gas requirements of Penicillium roqueforti (various strains of blue mold from cheese), N. S. Golding (*Jour. Dairy Sci., 20 (1937), No. 6, pp. 319–343, figs. 6*).—The Washington Experiment Station has studied the growth of various strains of *P. roqueforti* on different media and at incubation temperatures of 48°, 70°, and 85° F. as influenced by a high concentration of carbon dioxide or nitrogen in the surrounding atmosphere. The presence of carbon dioxide inhibited the growth of the several strains. The degree of inhibition was uniform with the medium, but varied with the concentration of carbon dioxide and the temperature. When the atmosphere was 75 percent carbon dioxide and 25 percent air, little more than germination occurred at 85°, the colonies attained about one-half normal size at 70°, and inhibition was almost total at 48°. Increasing the concentration of nitrogen in the atmosphere also affected the growth of the

several strains. In the presence of 3 parts of nitrogen to 1 part of air growth was slightly inhibited at 85°, normal at 70°, and at 48° growth was considerably accelerated over that in air. At the latter temperature even in 9 parts of nitrogen to 1 part of air there was no inhibition. When cultures were subjected to an atmosphere of low oxygen pressure but from which all carbon dioxide was removed by sodium hydroxide as an absorbent, practically all the oxygen was removed by the growing cultures at both 70° and 48°, indicating that the presence of carbon dioxide and not the lack of oxygen was the inhibiting factor. The significance of these findings in relation to the selection of a satisfactory starter in the manufacture of blue-veined cheeses is discussed.

A flavor constituent of blue cheese (roquefort type), B. W. HAMMER and H. W. BRYANT (*Iowa State Col. Jour. Sci., 11 (1937), No. 3, pp. 281–285*).—Experiments are reported in which the action of *Penicillium roqueforti* on various lower fatty acids was determined. Each of the fatty acids was added to sterile milk, and the milk was then inoculated with the mold spores and incubated at room temperature. In most cases a rapid development of mold occurred, and volatile acid determinations indicated that the fatty acids had largely disappeared. In the case of *n*-caprylic acid, no surface mold growth occurred for several days and an odor similar to the peppery odor of blue cheese was evident. Later mold growth developed and the characteristic odor disappeared. Other tests indicated that this odor was due to the formation of methyl-*n*-amyl ketone, and led to the conclusion that this product is formed from caprylic acid through the action of *P. roqueforti* under unfavorable growth conditions and that it is an important flavor contributant of blue cheese. This odor is conspicuous in many lots of cheese but is not evident in others, although it may be present to some extent and in the latter type of cheeses the desirable flavor appears to be supplied largely by the fatty acids.

The relationship between temperature and overrun in the whipping of ice cream mixes, A. LEIGHTON and A. LEVITON (*Jour. Dairy Sci., 20 (1937), No. 6, pp. 371–378, figs. 2*).—Experiments conducted by the U. S. D. A. Bureau of Dairy Industry, in which ice cream mixes containing varying percentages of butterfat, serum solids, and gelatin and homogenized at different pressures were frozen at various temperatures, gave evidence that an equilibrium exists between temperature and the overrun attainable in freezing ice cream mixes. This relationship was expressed by the straight line equation:

$$\text{Percentage overrun} = At + B.$$

In this t is the temperature and A and B are constants for any given ice cream mix. This equation must be qualified by stating the maximum overrun attainable for the mix and also by a statement of the number of minutes the mix can be beaten in the freezer before instability results; also freezing the mix to too low a temperature causes a departure from this equilibrium. The relationship of these findings to the usual manufacturing procedure for ice cream is discussed.

Twenty-fourth annual report of the International Association of Dairy and Milk Inspectors, compiled by P. B. BROOKS (*Internatl. Assoc. Dairy and Milk Insp. Ann. Rpt., 24 (1935), pp. 302, figs. 2*).—The following papers are among those presented before the annual meeting held at Milwaukee, Wis., October 10–12, 1935 (E. S. R., 73, p. 840): The Coordination of American Milk Control Effort, by L. C. Frank (pp. 9–21); Studies With A "Different Method" of Appraising Standard Plate Counts, by C. S. Leete (pp. 28–39); Educational Work as a Factor in Increasing the Extent of Pasteurization, by I. V. Hiscock (pp. 46–52); Radiation and the Microorganisms of Milk, by K. G. Weckel (pp. 69–74); Progress in Standardizing Laboratory Procedures, by R. S. Breed

(pp. 109–114); The Value of the Colon Test as a Means of Detecting Unsanitary Conditions on the Farm, by M. W. Yale and R. Eglinton (pp. 116–125); Sources of Infection in Septic Sore Throat Epidemics, by G. H. Ramsey (pp. 163–169); The Numbers and Kinds of Bacteria in Aseptically Drawn Milk, by H. R. Thornton and N. J. Strynadka (pp. 178–188); A Study of the Nutritional Value of Raw and Pasteurized Milk, by C. A. Elvehjem (pp. 196–202); and Ice Cream Contamination by Dippers (in Retail Stores), by D. W. Horn (pp. 249–256).

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[Report of work in animal pathology and parasitology by the Idaho Station] (*Idaho Sta. Bul. 221 (1937), pp. 23, 25, 26, 43–45, figs. 2*).—The work of the year referred to (E. S. R., 75, p. 690) includes grub in the head of sheep (sheep botfly) as the cause of nasal discharge, by C. W. Hickman; a study of the methods of eradication of pullorum disease, paratyphoid in turkeys (see page 858, and the cause and control of foul sheath in rams, all by W. V. Halversen; and the establishment of resistance of flocks to fowl paralysis (E. S. R., 76, p. 107) and the reduction of high mortality by selective breeding, both by C. E. Lampman.

[Report of work in animal pathology by the Kentucky Station] (*Kentucky Sta. Rpt. 1936, pt. 1, pp. 18–21*).—The occurrence of and work with (E. S. R., 76, p. 97) an epizootic or virus abortion in mares (E. S. R., 77, p. 102), paratyphoid of pigeons due to *Salmonella aertrycke*, isolation of *S. newport* from a fatal case of hemorrhagic enteritis in feeder cattle, identification of *S. oranienburg* from quail in Illinois and *S. senftenberg* from poults in New Jersey, tests of aseptically drawn milk for the presence of *Brucella abortus*, and grass tetany (E. S. R., 77, p. 103) are considered.

[Contributions on animal pathology] (*Ontario Vet. Col. Rpts., 1934–35, pp. 10; 1935, pp. 13–32, figs. 5*).—The first of these reports (E. S. R., 74, p. 99), covering the period November 1, 1934, to March 31, 1935, deals with the progress of the work with parasites and infectious diseases of livestock, by C. D. McGilvray; the second, covering the period April 1, 1935, to March 31, 1936, includes the following contributions: Breeding Difficulties in a Dairy Herd (pp. 13–15) and Outbreak of Depraved Appetite in Cattle (pp. 15, 16), both by R. A. McIntosh; Swine Plague (pp. 16–18), by T. L. Jones; Botryomycosis (pp. 18–20), Equine Encephalomyelitis (pp. 20–22), Pulpy Kidney Disease of Lambs (pp. 22, 23), and Malignant Diphtheretic Vaginitis of Cattle (pp. 23, 24), all by F. W. Schofield; Tuberculosis in Fur Bearing Animals (pp. 24–27) and The Control of the Flesh Fly, *Wohlfahrtia vigil*, and Other Flies (pp. 27–31), both by A. A. Kingscote; and Zoology in Relation to Veterinary Science (pp. 31, 32), by H. E. Batt.

[Studies in comparative pathology, etc., in Japan] (*Jour. Japan. Soc. Vet. Sci., 15 (1936), Nos. 2, pp. 128–163, figs. 8, pp. 23–29; 3, pp. 165–218, pls. 4, figs. 7, pp. 31–40; 4, pp. 219–221, 233–347, pls. 5, figs. 4, pp. 41–63, 66–84, pls. 4, figs. 3*).—The contributions presented in No. 2 (E. S. R., 76, p. 244) are: Studies on the Purification of Mallein—III, Chemical Analysis of Glanders Bacillus and Proteins Obtained From Its Culture, as Well as Its Nitrogen and Carbohydrate Metabolism, by M. Umezu (pp. 128–142, Eng. abs, pp. 23, 24) (E. S. R., 71, p. 97); Complement-Fixation Reaction in Rinderpest—II, On the Thermolability of the Antiserum, by J. Nakamura (pp. 143–158, Eng. abs. pp. 25–27) (E. S. R., 62, p. 260); and A Case of the Infection With *Bac[illus] abortus equi* in Man, by S. Fujimura and T. Hoshi (pp. 159–163, Eng. abs. pp. 28, 29).

Contributions in No. 3 are: On the Pathogenicity of Several Strains of Tubercle Bacilli for the Rabbit When Inoculated Separately or Jointly Into the Anterior Chamber of the Eye, by Y. Miyamoto and T. Shimazaki (pp. 165–173, Eng. abs. pp. 31, 32); Investigations on Immune Isoreactions of the Blood of Korean Cattle, II [trans. title], by J. Nakamura and N. Tomonaga (pp. 174–189, Ger. abs. pp. 33, 34) (E. S. R., 64, p. 771); Complement-Fixation Reaction in Rinderpest—III, Antigenic Properties of Pest and Normal Lymphatic Glands, by J. Nakamura (pp. 190–200, Eng. abs. pp. 35, 36) (see above); On the Formosan Chicken Mite *Neoschöngastia gallinarum* (Hatori 1920), by M. Sugimoto (pp. 201–213, Eng. abs. pp. 37, 38); and A Primary Carcinoma in the Liver of a Foetus, by H. Oguni and T. Ishida (pp. 214–218, Eng. abs. pp. 39, 40).

Contributions in No. 4 include: On the Epidemic Equine Encephalitis Which Occurred in the Year 1935 in Japan, by O. Emoto, S. Kondo, and M. Watanabe (Japan. abs. pp. 219–221, Eng. pp. 41–63); The Relation Between Diet and Trichina-Infection in Rats, by I. Motomura and M. Umezu (pp. 233–244, Eng. abs. pp. 66, 67); The Prevention and Treatment of Avian Coccidiosis, Particularly Through the Use of Jodinol [trans. title], by M. Yosikawa (pp. 245–261, Ger. abs. pp. 68, 69); Animal Experiments With the Scab-Virus of Sheep-Pox With Special Reference to Its Vaccinization, by S. Akazawa (pp. 262–276, Eng. abs. pp. 70–72); Abortion of Swine Due to *B[rucella] abortus suis*, by S. Nohmi, M. Katow, and S. Karasawa (pp. 277–285, Eng. abs. pp. 73–75); Studies on Contagious Abortion in Sheep—I, Outbreak of Contagious Abortion Among Ewes and of Malta Fever Among Veterinarians and Shepherds at the Rinsi Sheep-Farm in Rinsi (Inner Mongolia), by M. Itabashi and S. Watanabe (pp. 286–295, Eng. abs. pp. 76, 77); On the Colony-Type of *Streptococcus equi*—I, The Comparison of the Morphological, Cultural, and Biological Characters Between 3 Isolated Colony-Types, by S. Umeno (pp. 296–318, Eng. abs. pp. 78–81); and Experimental Studies on the Infectious Abortion in Mares—IV, Serological Observations, by K. Hirato (pp. 319–347, Eng. abs. pp. 82–84) (E. S. R., 76, p. 244).

p-Aminobenzenesulphonamide in bacterial meningitis, H. Proom and G. A. H. Buttle (*Lancet [London], 1937, I, No. 11, p. 661*).—It is pointed out that by applying the chemical method described by Fuller (below) for the detection of *p*-aminobenzenesulfonamide (sulfonamide) in the blood and urine of treated animals it is possible to show that, when given orally, it appears in the cerebrospinal fluid in remarkably high concentrations. Reference is made to a rabbit administered sulfonamide by mouth, in which the concentration of the drug found 4 hr. later in the cerebrospinal fluid was 1 in 5,000. It is noted that this has been shown to be sufficient to exert a strong bactericidal effect on the streptococcus in in vitro experiments with human blood and on the meningococcus in culture medium, and illustrates the remarkable ease with which the drug diffuses through the body. This appears to justify its oral administration in the treatment of bacterial meningitis.

Is p-aminobenzenesulphonamide the active agent in Prontosil therapy? A. T. Fuller (*Lancet [London], 1937, I, No. 4, pp. 194–198*).—It is pointed out that both Prontosil and *p*-aminobenzenesulfonamide (sulfanilamide) have a protective action against infection by hemolytic streptococci. A considerable amount of sulfanilamide having been found to be excreted when Prontosil is administered by mouth or by injection, it is considered quite possible that the therapeutic action of Prontosil is due to the sulfanilamide derived from it by reduction in the body.

The presence of agglutinins for Brucella abortus in milk, H. B. Morrison and F. E. Hull *(Kentucky Sta. Bul. 369 (1937), pp. 29-43)*.—The determination of the presence or absence of agglutinins for *B. abortus* in 448 samples of milk from separate quarters of the udders of 99 Bang's disease positive cows and 699 similar samples from 132 Bang's disease negative cows in the station and two large commercial dairy herds is reported upon. Of these 448 samples, 51 percent were negative and 19 percent showed partial and 30 percent complete agglutination at a dilution of 1:50. "The milk of 36 percent of the Bang's disease reactors gave no agglutination at 1:50 dilution, that of 5 percent showed partial, that of 19 percent showed complete agglutination, and the milk of 40 percent showed differences in titer from different quarters of the udder. The milk of 45 percent of the reactors, from one or more quarters of the udder, gave complete agglutination; that from 20 percent gave partial agglutination only. When milk from only one quarter was agglutinated the agglutination was very seldom complete. Milk samples taken at different times from the same quarter of the udder of the same cow showed considerable difference in agglutinin titer. The percentage of agglutinations was slightly higher in milk from the hindquarters of the udder than in that from the forequarters, and complete agglutinations occurred oftener in milk from the hindquarters than in that from the forequarters (33 and 26 percent). Difference in percentage of agglutinations in milk from right and left halves of the udder was not material (30 and 29 percent). In only one sample out of 699 (0.14 percent) did milk from Bang's disease negative cows show any agglutination. In this instance the agglutination was only about 25 percent complete at a dilution of 1:50."

The details are given in 8 tables, and a bibliography of 12 titles is included.

Studies on hemorrhagic septicemia, J. B. Taylor *(Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 2, pp. 182-185)*.—This contribution from the South Dakota Experiment Station reports upon a study made of a buffalo strain obtained from the U. S. D. A. Bureau of Animal Industry and known as culture Buffalo B, belonging to Jones' group III, which produces exotoxin and endotoxin.

"A toxoid was developed by treating toxin with formalin and precipitating with acetone. Toxoid, aggressin, and bacterins failed to produce an immunity in rabbits sufficient to protect against injection of Buffalo B strain. The various strains of the *Pasteurella* group are not soluble in bile, saponin, sodium oleate, cholesterol, sodium ricinoleate, or sodium desoxycholate. Sodium bicarbonate and neoarsphenamine had no effect on the progress of the disease when injected intravenously. Strains of hemorrhagic septicemia isolated from various animals are rarely pathogenic for rabbits except for a few strains. Those isolated from cases of fowl cholera were always pathogenic for rabbits. Hemorrhagic sèpticemia is not a common disease, with the exception of fowl cholera."

Phagocytic activity of circulating cells in the various types of leukemia, M. M. Strumia and F. Boerner *(Amer. Jour. Path., 13 (1937), No. 3, pp. 335-350, pl. 1)*.—A study aimed at the determination of the variations, if any, in the phagocytic activity of cells found circulating in the various forms of leukemia, as well as in normal blood, and the establishment of a physiological criterion for differentiation in addition to those well known morphologically.

Relation of bovine mastitis to human disease, P. B. Brooks and W. Von D. Tiedeman *(Amer. Jour. Pub. Health, 27 (1937), No. 4, pp. 334-338)*.—This discussion is presented with a list of 14 references to the literature.

The Rickettsia diseases: Varieties, epidemiology, and geographical distribution, H. Zinsser *(Amer. Jour. Hyg., 25 (1937), No. 3, pp. 430-463,*

figs. 4).—A review, presented with a list of more than 120 references to the literature.

The antigenic structure and classification of members of the Salmonella group [trans. title], G. HORNUS (*Rev. Immunol., 1 (1935), No. 5, pp. 488–500*).—This contribution to the classification of the *Salmonella* group is accompanied by 43 references to the literature. Particular mention is made of the work of P. B. White and of F. Kauffmann. See also a previous note (E. S. R., 72, p. 534).

Sporadic Salmonella infections, with a case report, J. H. FISHER (*Lancet [London], 1937, I, No. 11, pp. 623–625*).—A sporadic case of *S. aertrycke* infection in man is reported. This organism, which frequently affects domestic animals, is the one most commonly responsible for food poisoning in England.

Salmonella suipestifer infection in human beings: Review of the literature and report of twenty-one new cases, A. M. HARVEY (*Arch. Int. Med., 59 (1937), No. 1, pp. 118–135*).—This review of the literature relating to hog cholera bacillus infection in man is presented with a list of 57 references.

The present status of the practical control of streptococci in certified milk, W. D. FROST (*Amer. Assoc. Med. Milk Comns. [etc.], Proc., 25–28 (1932–35), pp. 44–47*).—A contribution presented at the conference of the American Association of Medical Milk Commissioners and the Certified Milk Producers' Association of America held in May 1932 in Washington, D. C.

Studies on the differentiation of hemolytic streptococci, P. R. EDWARDS (*Amer. Assoc. Med. Milk Comns. [etc.], Proc., 25–28 (1932–35), pp. 47–50*).—A practical contribution presented at the conference referred to above.

Studies on active acquired resistance, natural and artificial, in the rat to infection with Strongyloides ratti, A. J. SHELDON (*Amer. Jour. Hyg., 25 (1937), No. 1, pp. 53–65*).—In quantitative studies on acquired resistance in rats to infection with *S. ratti*, here reported, it was found that they could be successfully immunized by serial infections, using small doses of infective larvae. This resistance was as effective in preventing reinfection at 30 days as it was a few days after the last immunizing infection. An almost absolute resistance was demonstrated to be acquired and retained by rats as the result of a single previous infection which had been allowed to run its normal course and disappear. Rats could be successfully immunized against infection with *S. ratti* by serial injections of heat-killed larvae in a saline suspension. Animals which had received 13 such injections at 3-day intervals (10 of 1,000 and 3 of 2,000 larvae) were as refractory to test infections as were animals immunized by previous or existing infections.

A list is given of 17 references to the literature.

Some experimental studies on Strongyloides ratti, A. J. SHELDON (*Amer. Jour. Hyg., 25 (1937), No. 1, pp. 39–52, figs. 2*).—Quantitative data on some of the technical aspects involved in studies on *S. ratti* in the laboratory rat and certain of the biological relations between this parasite and its host are presented. The results indicate that consistently high percentages of development (22.1 on the average) can be obtained by subcutaneous infection of rats with larvae which have been cultured at 24° C. for 48 hr. and isolated in the Baermann apparatus for 45 min. The use of the daily larval output to measure the size of infection is shown to be impractical. An autopsy method by which an accurate count of the worms in the intestine of the rat can be made is suggested as being more satisfactory. A report is made of some of the biological relations determined by the experiments.

The localization of Trichinella spiralis in the muscle of its host, C. H. SCHEIFLEY (*Amer. Jour. Hyg., 25 (1937), No. 2, pp. 349–358*).—A study of the

probable factors involved in the remarkable specificity in localization of the nematode parasite *T. spiralis* in muscle has shown that the diaphragm is more heavily infested than the muscles of the extremities. Complete unilateral lumbar sympathectomy with its resultant increased blood flow produced no significant change in the degree of localization in the operated limb as compared with the normal limb.

A study of the effect of age, weight, sex, and dose on the length of survival of albino rats infected with Trypanosoma equiperdum, with particular reference to variations in the host, C. A. Morrell, C. W. Chapman, and M. G. Allmark (*Amer. Jour. Hyg., 25 (1937), No. 2, pp. 232–258, figs. 9*).—This is a report of the effect of dosage in *T. equiperdum* infections in the white rat and of sex, age, and weight of the host on the duration of the disease and the rate of increase of the parasites in the blood.

Studies on bovine blood.—I, The sedimentation rate and percentage volume of erythrocytes in normal blood, L. C. Ferguson (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 2, pp. 163–175, figs. 2*).—The results of sedimentation studies of the red blood corpuscles of 22 cows, including the sedimentation rate and percentage volume, are reported. The mean sedimentation index of this herd of cattle, calculated from the individual means, is 2.394 mm, with a standard deviation of 0.275 mm, a value of over 4 mm being indicative of pathology. "The mean percentage volume of erythrocytes, calculated from the individual means, is 31.32 percent, with a standard deviation of 2.194 percent. The results of analysis of variance with both the sedimentation index and the percentage volume indicate a highly significant difference between individuals as compared to that within individuals. The correlation coefficients of the sedimentation index and the percentage volume of erythrocytes possibly indicate a significant negative correlation. The relatively high fibrin content of normal bovine serum may account for the slow sedimentation rate.

"Since the sedimentation rate is increased in certain pathological conditions, application of the sedimentation test and percentage volume determinations may be of practical value as an aid in diagnosis and prognosis of certain cattle diseases."

Further observations on staphylococcic infections of the bovine udder, R. Gwatkin (*Canad. Pub. Health Jour., 28 (1937), No. 4, pp. 185–191*).—A report is made on 19 cases of mastitis, apparently due to staphylococci, that were detected during the examination of 260 cows. One hundred and ninety of the 275 strains of *Staphylococcus pyogenes* fermented mannitol, and 85 were negative. Twenty-four positive (12.5 percent) and 60 percent of the negative strains were recovered from apparently normal udders. Forty of 65 strains of staphylococci showed some degree of zone production on Stone's beef extract-gelatin-agar plates, and 11 of these liquefied Stone's beef extract-gelatin. Seventeen kittens were given intraperitoneal injections of 3 cc of boiled filtrates of some of these strains, and 7 of them showed some gastrointestinal symptoms, in one case severe. Agglutination and complement-fixation tests on blood serum and whey from streptococcic and staphylococcic cases were negative.

Pulmonary coccidioidal granuloma: A new site of infection in cattle, C. L. Davis, G. W. Stiles, Jr., and A. N. McGregor (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 2, pp. 209–215, figs. 6*).—Pulmonary lesions in bovine coccidioidal granuloma are reported for the first time, 47 new bovine cases having been observed. A survey of additional cases of coccidioidal granuloma in both man and animals continues to show a decided concentration of the disease in the San Joaquin Valley in California.

The occurrence of Onchocerca gutturosa Neumann in cattle in England, with an account of its life history and development in Simulium ornatum Mg., J. S. Steward (*Parasitology, 29 (1937), No. 2, pp. 212–219, pl. 1*).—The occurrence of *Onchocerca* in English-bred cattle is recorded for the first time. A specific diagnosis of *O. gutturosa* is made, *O. bovis* being regarded as a synonym.

"The microfilariae occur in the skin of infected cows, and blood-sucking flies of the genus *Simulium* were found to be the vectors. Complete development was observed in *S. ornatum* and partial development in *S. erythrocephalum*. *S. ornatum* appears to be a very efficient intermediary host, as over 40 percent became infected. *Culicoides nubeculosus*, the vector of *O. cervicalis* of horses, does not appear to carry the bovine *Onchocerca*."

Rickettsia bovis: A new species pathogenic for the bovine [trans. title], A. Donatien and F. Lestoquard (*Bul. Soc. Path. Exot., 29 (1936), No. 10, pp. 1057–1061*).—A parasite of the monocytes transmitted by ticks of the genus *Hyalomma* in Iran, where it is the cause of a mild affection that results in a premunition of the host, is described as new under the name *R. bovis*.

A morphological study of bovine schistosomes, L. van den Berghe (*Jour. Helminthol., 15 (1037), No. 2, pp. 125–132, pl. 1, fig. 1*).—In reporting upon a morphological study of the bovine schistosomes from the Belgian Congo the author has relegated the species *Schistosoma mattheei* to the rank of a variety of *S. bovis*. In view of the morphological relationships existing among the four schistosomes—*S. haematobium*, *S. intercalatum*, *S. mattheei*, and *S. bovis*, he was led to conclude that these constitute biological races of a single species.

[Report of work with bighead in sheep], A. B. Clawson and W. T. Huffman (*Natl. Wool Grower, 25 (1935), No. 1, pp. 18–20, figs. 3; 26 (1936), No. 1, pp. 18–21, figs. 5; 27 (1937), No. 3, pp. 13–16, figs. 5*).—Work aimed at the determination of the cause or causes of the serious losses of sheep from bighead occurring in the Intermountain States, particularly in Utah, Nevada, eastern Oregon, and southern Idaho, commenced in March 1934 and carried on by the U. S. D. A. Bureau of Animal Industry, is reported upon.

Feeding experiments have shown that (1) the so-called coal oil brush or littleleaf horsebrush (*Tetradymia glabrata*), which is present on most of the principal grazing areas of Utah, the southwestern and northeastern corners excepted, and occurs in certain areas in Nevada, Oregon, and Idaho, and (2) the spineless horsebrush (*T. canescens* or *T. canescens inermis*), which occupies most of the bighead areas in central and eastern Nevada, northeastern and southwestern Utah, most of Idaho except the southwestern portion, as well as southwestern Wyoming and southwestern Montana, are the sources of this affection. The bighead areas were found to be almost identical with the habitat of these two plants.

The evidence obtained indicates that throughout the regions studied the serious outbreaks have occurred in or very shortly after the sheep have passed through areas where one or the other of these plants was abundant, and that the conditions were favorable for the eating of them.

Mortality in sheep due to the ingestion of the foliage of myall trees (Acacia pendula) infested with the boree moth Teara contraria, W. L. Hindmarsh (*Austral. Vet. Jour., 13 (1937), No. 3, pp. 124, 125*).—The inflammatory lesions of the abomasum and small intestine of sheep fed on the foliage of the myall, a valuable drought fodder tree relished by sheep in the drier parts of New South Wales, are considered to have been due to irritation caused by the hairs of caterpillars of the boree moth *T. contraria*.

Occurrence of a conjunctivitis of sheep in Algeria due to Rickettsia conjunctivae Coles 1931 [trans. title], A. DONATIEN and F. LESTOQUARD (*Bul. Soc. Path. Exot.*, *30* (*1937*), *No. 1*, *pp. 18–20*).—Report is made of a contagious conjunctivitis in sheep, caused by *R. conjunctivae* and at times widespread in Algeria.

Sheep scab: Remedial measures reviewed, E. A. LEWIS (*Bul. Ent. Res.*, *28* (*1937*), *No. 1*, *pp. 11–30*, *pl. 1*).—This review is presented, with a list of 21 references to the literature.

Sheep myiasis in south-west Scotland, with special reference to the species involved, A. J. HADDOW and R. C. MUIRHEAD THOMSON (*Parasitology*, *29* (*1937*), *No. 1*, *pp. 96–116*, *figs. 3*).—In the investigation of myiasis in certain districts of southwest Scotland, larvae from sheep were collected and reared in flyproof apparatus. The fly season was found to last approximately from May to September, reaching its height in July and August. The flies were found to be partial to low-lying, sheltered ground, especially where much bracken was present. The hibernation of various species was studied, and they were found to pass the winter as prepupae, pupation never occurring until April or May. "Several species of carrion-feeding blowfly besides *Lucilia sericata* were found to be causing secondary myiasis, occasionally and in small numbers, in certain districts, mainly in the west. The species involved were *L. caesar*, *L. illustris*, *Protophormia terraenovae*, *Calliphora erythrocephala*, *C. vomitoria*, and *Muscina pabulorum*. Four of these species, *L. illustris*, *P. terraenovae*, *C. vomitoria*, and *M. pabulorum*, have not previously been recorded from sheep. Records of cases in which these flies occurred are given."

A study of Spirochaeta penortha (n. sp.) isolated from foot-rot in sheep, W. I. B. BEVERIDGE (*Austral. Jour. Expt. Biol. and Med. Sci.*, *14* (*1936*), *No. 4*, *pp. 307–318*, *figs. 8*).—The organism recorded by the author in 1935 (E. S. R., 74, p. 855) as being constantly present in foot-rot lesions has been isolated in pure culture, its morphology, cultural characters, and pathogenicity for experimental animals being described. "It grows in a medium commonly used for the cultivation of spirochetes, but more rapidly and abundantly in culture media containing raw potato. Cultures are almost devoid of pathogenicity for experimental animals. Specific agglutination was demonstrated in high dilution with prepared antiserums. Although typically the organism lacks discernible spirals, its other characteristics necessitate its classification as a spirochete. The name *S. penortha* is proposed. It is possibly identical with *Treponema podovis*, already described in foot-rot lesions, but it does not agree with descriptions of that organism."

Pseudotuberculosis of deer, H. HAMMERSLAND and E. M. JONESCHILD (*Jour. Amer. Vet. Med. Assoc.*, *91* (*1937*), *No. 2*, *pp. 186–192*, *fig. 1*).—Experiments in which eight guinea pigs, three rabbits, two chickens, one dog, and a mouse were inoculated with suspensions of *Corynebacterium ovis* are reported. Guinea pigs, rabbits, and mice were found to be susceptible, and chickens and dogs apparently not susceptible to this organism. The percentage of infection was found to be small in deer compared to that in sheep. "All transmission experiments and cultural morphological characteristics classify this organism found in deer to be that of the species *C. ovis*."

Renguera, J. F. MITCHELL (*Jour. Amer. Vet. Med. Assoc.*, *91* (*1937*), *No. 2*, *pp. 176–181*, *figs. 2*).—An account is given of renguera, also known as paraplegia enzoótica (Span.), paraplegia enzootique des agneaux (Fr.), louping ill, and swing-back, a paraplegia of lambs, kids, llamas, alpacas, and vicunas caused by a filtrable, infectious, and inoculable virus which attacks the cen-

tral nervous system, causing locomotor ataxia. It was first studied in 1911 during an outbreak which occurred around Cerro de Pasco in central Peru, in which about 90 percent of the lambs died. In a fifth outbreak in December 1936, and now in progress, about 30 percent of the lambs were attacked.

The susceptibility of hogs to red squill, J. C. WARD, C. W. BARBER, F. E. GARLOUGH, and J. C. MUNCH (*Jour. Amer. Pharm. Assoc., 26 (1937), No. 2, pp. 137–139, figs. 2*).—Reports of animal losses, particularly hogs, presumably caused by the consumption of red squill baits exposed for rat control, led to the tests here reported. Animals purchased on the Denver, Colo., market, after having been proved to be normal, were starved from 24 to 72 hr. and then fed varying amounts of red squill powder and of extract. The powder was found to be lethal when administered by stomach tube in doses of 175 mg per kilogram of weight and above. Red squill extract was lethal to hogs when given by stomach in doses of 500 mg per kilogram. Most hogs will not eat enough red squill rat poison voluntarily to cause death. The red squill powder causes emesis in hogs, which tends to protect the animals when baits are consumed normally.

The physiology of digestion in larvae of Gastrophilus equi, D. N. ROY (*Parasitology, 29 (1937), No. 2, pp. 150–162*).—In reporting upon the physiology of digestion of the horse botfly in the horse, it is pointed out that horses do not show any symptoms even when there is a heavy infestation because the larva does not feed on blood but lives on the fluid material partly digested by its host in the stomach.

A relationship in equines between age of host and number of strongylid parasites, A. O. FOSTER (*Amer. Jour. Hyg., 25 (1937), No. 1, pp. 66–75, fig. 1*).—During quantitative studies in the Panama Canal Zone of the worm burdens of 86 equines, varying in age from 9 to 30 yr., it was found that "from 59 animals, 15 yr. and under, there was recovered an average of 1,219 worms per animal as compared to an average of 502 worms from 27 animals over 15 yr. This was interpreted as an age resistance of equines against strongylid parasites and was demonstrated quantitatively for the commoner individual species. In the instances of *S[trongylus] vulgaris*, however, the data afforded no evidence of increased protection in the older animals. This was considered significant in view of the importance of the parasite. In addition, it was concluded that in the data of the present studies there was no evidence of an age resistance of equines against stomach worms."

Researches on Rickettsia canis: A comparison with R. conori [trans. title], A. DONATIEN and F. LESTOQUARD (*Bul. Soc. Path. Exot., 29 (1936), No. 10, pp. 1052–1056*).—Epizootiological observations and experimental inoculations with emulsified ticks indicate that the brown dog tick serves as an agent in the transmission of *R. canis*. *R. canis* and *R. conori* are considered to represent two distinct species. *R. canis* has been observed not only in Algeria but also in France along the Mediterranean coast.

The histopathology of natural and experimental canine distemper, W. A. DEMONBREUN (*Amer. Jour. Path., 13 (1937), No. 2, pp. 187–212, pls. 5*).—A review of work on canine distemper is given with a list of 30 references. The lesions believed to be characteristic of the disease are described.

"The virus of canine distemper has a definite affinity for vascular endothelium and for cells of the reticulo-endothelial system. The virus spreads in the body of the host mainly by way of the blood stream. We have obtained no evidence that it passes along the nerve pathways. The natural route of infection is by way of the respiratory tract. The occurrence of nuclear inclusions, heretofore unreported, in liver cells, bronchial epithelial cells, glandular

cells of the stomach and intestine, and bile duct epithelial cells, and cytoplasmic inclusions in bile duct epithelial cells are described. A heretofore unreported clinical type of the disease with a characteristic microscopic pathology is described and has been reproduced in puppies. Various clinical types of the disease have been induced in puppies with a single strain of virus. The histopathology and cytology of the disease in dogs and ferrets are quite similar."

The toxicity of Crotalaria retusa L. seeds for the domestic fowl, M. W. Emmel (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 2, pp. 205, 206*).—In an experiment at the Florida Experiment Station force feeding Leghorn hens with single doses of 100 *C. retusa* seeds caused death within 14 days and single doses of 200 seeds caused death within 10 days. Chronic cases of poisoning were induced by force feeding 10 seeds every other day, death occurring in from 18 to 40 days. In five birds fed a grain mixture containing seeds of *C. retusa* scattered on the ground once a day, death occurred in from 15 to 32 days.

[Work with diseases of fowl by the Massachusetts Station] (*Massachusetts Sta. Bul. 339 (1937), pp. 87–90*).—In this report of the year (E. S. R., 75, p. 537) brief reference is made by H. Van Roekel, K. L. Bullis, O. S. Flint, and M. K. Clarke to the progress of pullorum disease eradication (E. S. R., 76, p. 107), antigenicity studies of *Salmonella pullorum* strains, its viability, the whole blood agglutination test, maltose-fermenting *S. pullorum* strains, pullorum disease in turkeys (encountered in two flocks during the year), disease studies of ruffed grouse and paratyphoid infection in young pheasants, diagnosis of ulcerative enteritis of turkeys and of an organism resembling *Erysipelothrix rhusiopathiae*, flock mortality studies, and epidemic tremor in chicks.

[Work with avian diseases by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1936], pp. 39, 40*).—A brief report is made of the work of the year (E. S. R., 75, p. 849) with infectious rhinitis (coryza), in which during the course of studies of *Hemophilus gallinarum* (E. S. R., 75, p. 547) a secondary micro-organism, *Shigella nasalis*, was isolated from infected chicks; infectious bronchitis; leucosis; and cerebral disorder of chicks.

The problem of infection as presented by bacterial invasion of the chorioallantoic membrane of chick embryos, E. W. Goodpasture and K. Anderson (*Amer. Jour. Path., 13 (1937), No. 2, pp. 149–174, pls. 4*).—The authors have found the inoculation of the chorioallantoic membrane of chick embryos with pure cultures of pathogenic bacteria to be a practical method for studying many problems of infection, especially the early stages of invasion. "Many pathogenic bacteria find in either mesodermal cells (fixed or mobile) or epithelial cells, or both, favorable and possibly necessary media for invasion of the living host. In these instances phagocytosis, instead of representing resistance to infection, actually favors it. Among those pathogenic bacteria that are able to utilize a living intracellular environment for growth are *Str[eptococcus] viridans*, *A[erobacter] aerogenes*, *E[berthella] typhi*, *Br[ucella] abortus*, and *Myco[bacterium] tuberculosis avium*. *Staph[ylococcus] aureus* and *Str[eptococcus] hemolyticus* may be in part destroyed by the phagocytes of the embryo, and they appear to be incapable of growing in an intracellular medium in this host."

Fowl leukosis, C. D. Lee, H. L. Wilcke, C. Murray, and E. W. Henderson (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 2, pp. 146–162*).—This contribution includes the results of seven transmission experiments with fowl leucosis, which term is used to include in common the group of leukemic, aleukemic, and

leukemiclike diseases of fowl. Young chicks have been found to be more susceptible than older ones, with the greatest incidence between the ages of 2 and 12 mo., the majority of cases occurring between 4 and 10 mo.

"The disease in all of its expressions may be transmitted to healthy chicks by injection of tissue suspensions of affected tissues or by injection of cell-free filtrates. It may be transmitted by direct pen contact or by rearing chicks on contaminated litter. Neurolymphomatosis gallinarum, associated with eye lesions, hemocytoblastosis, lymphoid, erythroid, and myeloid types of leucosis are different expressions of the same disease and were transmitted by a common etiological agent. Erythroleucosis and myeloid leucosis manifestations are largely dependent upon involvement of the bone marrow. The lesions may be localized in one area or may be generalized. The injection of a suspension made from one type apparently produces practically all the various types considered as expressions of this disease. Different suspensions were used in all groups of the experiment, but practically the same results were obtained in each group. The incidence is often very high in spontaneous infected flocks. The lesions may be confined to one or more types of tissue in some cases and to some other type or types in other cases. Breed and sex differences apparently do not affect the incidence of the disease. There appears to be an inherent difference of susceptibility and resistance by different birds and birds of different strains. The disease spreads rather slowly in infected flocks, and only a few birds are clinically affected at one time. There seems to be some evidence to suggest that the disease may be transmitted through the egg to a limited extent. The evidence indicates that fowl leucosis is an infectious disease, and the transmissible agent is a filtrable virus. The clinical course is variable, extending over a period of weeks or months in some cases, while in others it is comparatively short. No complete recoveries occur, although temporary respites from the disease have been noted.

"This disease is one of the most important diseases confronting the poultry industry. The most important methods of control are proper sanitation and the use of breeding stock from resistant sources."

A list is given of 37 references to the literature.

Transmissible splenomegaly of fowls or reticulo-endothelial leucosis ("erythroleucosis"), H. P. Bayon (*Roy. Soc. Med. [London], Proc., 30 (1937), No. 4, pp. 377–384*).—Following a review of previous investigations abroad, presented with a list of 25 references to the literature, the author's observations on splenomegaly in fowls in Great Britain are reported.

"In fowls from different parts of England a deadly disease has been observed which is characterized by the appearance of a dark swollen liver and a much-enlarged spleen; the blood was found to contain an increased number of immature monocytes. Histological examination of the internal organs showed that the condition was due to a diffuse proliferation of the reticuloendothelial system of the liver, spleen, and bone marrow; at times lungs and ovary were involved. Kidney might also be affected, but here enlargement seemed to be due to an invasion by monoblastlike cells. Nerves were not found infiltrated, the type of cell in this ailment differing from that involved in neurolymphomatosis gallinarum. The disease could be accurately named 'reticuloendothelial leucosis', since anemia is not an outstanding or primary feature; at no time are large numbers of immature erythrocytes or even erythroblasts detectable in the blood, as in yellow anemia or erythromyelosis. The invasion of the blood by immature monocytes or monoblasts occurs in later stages and is preceded by hypertrophy of the hepatic and splenic reticuloendothelium.

"These investigations not only confirm the independent origin of erythrocytes and lymphocytes in fowls, but also indicate that monocytes arise in the reticuloendothelium of the marrow, spleen, and liver, and differ in behavior from histiocytes. The identity of the disease observed in England with that described as erythroleucosis on the Continent has been ascertained by obtaining virus from Budapest and then comparing the lesions obtained by the inoculation of this virus with those observed in this country, either in the field or after inoculation with tissues of leucotic fowls from Dorset. . . .

"The term 'leucosis' might be reserved for those conditions, occurring in birds and other animals, in which the morbid condition consists in the primary proliferation of lymphoidal cells (monoblasts or histiocytic cells) in the tissues, with their secondary invasion of the circulation as monocytes or blood histiocytes."

Studies on oöcyst production in avian coccidiosis, I, II, D. C. Boughton (*Amer. Jour. Hyg., 25 (1937), No. 2, pp. 187–211*).—In the first (pp. 187–202) of the two contributions here presented, a technic for counting the oocysts of avian coccidia which consists essentially of dilution counts on suspensions of dried feces is described. Single counts readily differentiate the various levels of oocyst production encountered in natural and experimental infections. Dried samples can be stored conveniently and do not deteriorate. The counting technic is capable of demonstrating parasite populations (*Isospora* in English sparrows) of a markedly lower order than those which can be observed microscopically in avian malarias.

In the second contribution (pp. 203–211) chronic infections in the sparrow due to *Isospora* are considered.

Studies on oocyst production in avian coccidiosis.—III, Periodicity in the oocyst production of eimerian infections in the pigeon, D. C. Boughton (*Jour. Parasitol., 23 (1937), No. 3, pp. 291–293*).—Data on the findings in five pigeons, trapped in Boston in November 1933, confined as a group in the same cage, and on the findings when placed in separate cages, are reported in tables in this further contribution.

Sulfur in the control of external parasites of chickens.—Preliminary report, M. W. Emmel (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 2, pp. 201–204*).—In an experiment at the Florida Experiment Station in which commercial laying mash containing 5 percent commercial flowers of sulfur was fed to hens, their infestation by lice (*Menopon stramineum* and *M. gallinae*) was considerably reduced at the end of 2 weeks and by the close of the third week none could be found. A similar result was obtained when the experiment was repeated. Infestations by the sticktight flea of fowls receiving such treatment augmented by sulfurizing the yards at the rate of 100 lb. of sulfur per 400 sq. ft. of area and placing a light coating of sulfur on the floor of the houses beneath the litter were brought under complete control in 3 weeks. Infestations on fowl tick-infested flocks were reduced, and reinfestation did not occur. Direct contact with sulfur was found to kill the adult flea in from 5 to 10 min. at room temperature. The chicken mite was controlled in several poultry houses by dusting the floors, dropping boards, and nests with sulfur.

An erysipelas outbreak in turkeys, D. E. Madsen (*Jour. Amer. Vet. Med. Assoc., 91 (1937), No. 2, pp. 206–208*).—This is a report by the Utah Experiment Station on the outbreak of erysipelas due to *Erysipelothrix rhusiopathiae* in a flock of 1,300 5½-month-old turkeys, which resulted in the death of 325 (25 percent).

Paratyphoid in turkeys, V. A. Cherrington, E. M. Gildow, and P. Moore (*Poultry Sci., 16 (1937), No. 4, pp. 226–231*).—Contributing from the Idaho Ex-

periment Station, the authors report having found a *Salmonella aertrycke* type organism to be responsible for several outbreaks of paratyphoid in turkeys in widely separated localities in that State.

Paratyphoid infection of turkeys may be characterized as an endemic septicemic disease of poults. The poults died rapidly up to 10 days of age, with weakness and occasional diarrhea as the common symptoms. No outstanding diagnostic symptoms or lesions were present. Older poults were more chronically affected and responded to good hygienic and management practices. One-third to one-half of the hens in the breeding flocks that produced affected poults reacted when tested by the agglutination test with antigen made from the *S. aertrycke* type organism. One flock of hens producing paratyphoid-free poults did not show any reactors.

The *S. aertrycke* type organism was isolated from 3 out of 30 dead-in-the-shell poults cultured from one flock. The organism was not detected in 23 infertile eggs from the same flock. The causative organism was isolated from the ovaries of 2 out of 6 hens examined. These birds were from a flock in which 13 reacted out of 24 tested.

Attempts to eliminate the disease by fumigating the eggs in the incubator, by isolating the poults in sanitary quarters, and by the use of medication in the drinking water were not effective. Low vitality in the poults at hatching time and overheating them in the brooder house appeared to reduce their resistance to the infection and to raise the mortality rate. One lot of 38 poults brooded at the University in a battery brooder under good conditions showed a mortality of less than 50 percent up to 12 weeks of age. Poults from the same hatch, when brooded on the turkey farm, showed a mortality of approximately 90 percent. Clean 10-week-old poults brought in from outside sources and ranged with poults from the affected flock died extensively from paratyphoid infection.

The data accumulated in this study seem to indicate that the initial infection was present in the ovaries of the breeding hens; that it was transmitted to fertile eggs and directly to the poults that hatched from such eggs; and that the infection spread rapidly in the incubator and brooder to poults that were not infected at hatching time.

A list is given of 9 references to the literature.

The nematode Ornithostrongylus quadriradiatus, a parasite of the domesticated pigeon, E. Cuvillier (*U. S. Dept. Agr., Tech. Bul. 569 (1937), pp. 36, figs. 6*).—A study is reported of the taxonomy, life history, host-parasite relations, and pathogenicity of the small roundworm *O. quadriradiatus*, which is associated with a serious disease and of which since 1930 there have been numerous outbreaks among pigeons in various parts of the world.

The taxonomic studies indicated "that *O. crami* Pérez Vigueras 1934, described from Cuba, is synonymous with *O. quadriradiatus*. Similar study of specimens from Panama revealed that they are less closely related to *O. quadriradiatus* than to *O. fariai* and that they probably belong to the latter species. They differ from *O. quadriradiatus* most markedly in length of the worms, size of the dorsal ray of the bursa, and spicule length. According to morphological observations, the spicule length of *O. quadriradiatus* does not vary markedly in specimens from different parts of the country nor in male worms of different ages.

"The life history was shown to be of the direct and simple type. Eggs in the 32- or 64-cell stage, when passed in the feces of the host, may hatch within 19 hr. under favorable conditions; a rhabditiform larvae emerges. The first-stage larva molts within about 8 hr., becoming the second-stage larva. The second

molt occurs usually on the third day, the larva then becoming filariform, ensheathed, and infective for the host. This third-stage larva may be distinguished by its dorsal and two subventral tail papillae. The fourth stage and the adult stage are passed within the intestine of the host; eggs may appear in its feces 5 to 6 days after infection."

The eggs were found to be nonresistant to drying and to a very low temperature; neither were the first- and second-stage larvae resistant to heat or drying. The third-stage larvae were killed by strong sunlight within a few hours. "Drying for 24 hr. killed a large percentage of infective larvae. Exposure to extreme cold for a short period, however, did not kill them. Placing them in water an inch deep killed the infective larvae, possibly because of decreased oxygen supply. Survival of larvae on soil, either shaded outdoors or in boxes in the laboratory, was considerably shorter in duration than that in water cultures in the laboratory. Infective larvae were observed to migrate laterally about 2 in. and vertically as much as 3 in. . . . Attempts to infect chickens, turkeys, and a duck were unsuccessful except for the development of 11 fourth-stage larvae in 1 chicken. . . .

"Control of this parasite should be based mainly on destruction of the preparasitic stages. This can be done effectively by drying and exposure to sunlight. It is advisable to separate immediately any infested birds."

A list is given of 40 references to the literature cited.

Toxoplasma in North American birds and attempted transmission to canaries and chickens, C. M. Herman (*Amer. Jour. Hyg., 25 (1937), No. 2, pp. 303–312, pl. 1*).—In the study here reported, *Toxoplasma*, a genus of parasites which has been found in the white blood cells and lymphocytes of mammals and birds, has been detected in many species of passerine birds, having been found in Syracuse, N. Y., and Beltsville, Md., and on Cape Cod, Mass. It is suggested that only one species occurs in birds, for which *T. paddae* Herman, possibly synonomous with *T. gondi*, is believed to be the correct name. Attempted transmission from sparrows to canaries and to chickens resulted negatively.

A list of 27 references to the literature is given.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Idaho Station], H. Beresford (*Idaho Sta. Bul. 221 (1937), pp. 12–16, fig. 1*).—The progress results are briefly presented of investigations on plow development for pea weevil control; high-speed combines and reel and bunching equipment for peas; alcohol-gasoline blends for engine fuel; farm building failures; earth type potato storage cellars; and rural electrification.

[Agricultural engineering investigations by the Massachusetts Station], C. I. Gunness et al. (*Massachusetts Sta. Bul. 339 (1937), p. 8*).—Progress results are briefly presented of investigations on low-lift pumps for cranberry bogs, milk cooling (with W. H. Tague), and cranberry storage.

Surface water supply of the United States, 1935, Parts 1, 2, 3 (*U. S. Geol. Survey, Water-Supply Papers 781 (1937), pp. 421, pl. 1; 782 (1937), pp. 233, pl. 1; 783 (1937), pp. 400, pl. 1*).—These papers present the results of measurements of flow made on streams during the year ended September 30, 1935, No. 781 covering the North Atlantic slope basins; No. 782, the South Atlantic slope and eastern Gulf of Mexico basins; and No. 783, the Ohio River Basin.

Use of irrigation water on farm crops, A. E. Palmer (*Canada Dept. Agr. Pub. 509 (1936), pp. 51, figs. 7*).—The results of a large number of experiments

are reported which were conducted at the Dominion Experimental Station at Lethbridge, Alta. These were planned to determine the stage of plant growth when water should be applied to field crops, the value of fall irrigation, and the number of irrigations required in different years by various crops. Data are reported from experiments on the irrigation of wheat, alfalfa, potatoes, sugar beets, and sunflowers, covering a period of from 2 to 6 yr.

One irrigation produced a good crop of wheat in the years of average rainfall. In the drier seasons, two applications of water were needed. Irrigating in the fall after harvest for the succeeding year's wheat crop proved to be a good practice. If a fall irrigation was not given, and if the precipitation of May and early June was not abnormally high, it was found essential to irrigate after the crop was up in the spring but before the plants were checked in growth by lack of moisture. Contrary to the usual opinion, irrigating wheat as early as the three-leaf stage did not reduce yields on the sandy clay-loam soils where the experiments were conducted. When wheat needed more than one irrigation, good results were obtained when the second application was made in the flowering stage. Irrigating wheat in the soft-dough stage did not increase yields, but sometimes caused the grain to lodge.

In each year of the experiments, except the wet year of 1927, alfalfa required at least two irrigations to produce two good crops. It was found necessary to apply one of these the previous fall or in early May to give a heavy first cutting of hay. If May was dry, an irrigation when the first crop was about 12 in. high increased the yields. It seemed to make little difference in the yields of the second crop whether the water for the second irrigation was applied 10 days before or immediately after cutting the first crop.

Irish Cobbler potatoes, irrigated when the plants were half-grown, gave lower yields than if the first irrigation was postponed until the plants were starting to bloom. In the drier seasons an irrigation in the starting-bloom stage and two subsequent irrigations at intervals of 20 days was the most satisfactory practice. There was no consistent difference observable in the cooking quality of potatoes receiving different irrigation treatments. When the plants were retarded in growth from lack of water and then irrigated, second growths, resulting in knotty tubers, were prevalent. The potatoes receiving five or six irrigations produced tubers with enlarged lenticels, but the cooking quality did not appear to be impaired. The greater number of irrigations produced more small potatoes than one or two irrigations.

Sugar beets have given the best yields and the highest sugar content when the soil has been kept moist enough for maximum growth during the entire growing season. In dry years this has required irrigating as often as every 2 weeks from the first or second week of July to early September on loam soils.

Sunflowers gave best yields on fall-irrigated land or with a spring irrigation when the plants were about 6 in. high. In the 2 yr. of the test with sunflowers one irrigation in the season was sufficient. This crop wilted noticeably if the soil became too dry, but revived and produced fair yields when water was applied.

The experiments indicate that, including the available water in the soil at the beginning of the season, wheat requires from 1½ to 1¾ acre-ft. of water, alfalfa from 1¾ to 2¼, and potatoes about 1½ acre-ft. to produce good crops.

Soil moisture determinations made of each foot-depth of soil to a depth of 6 ft. before and after each irrigation showed that a 6-in. application of water failed to penetrate into the soil to a depth of 6 ft. in more than half the plats when the soil moisture content was below 11 percent at the time of

irrigation. With a moisture content between 11 and 13 percent, from 60 to 70 percent of the observations showed that the water had penetrated to 6 ft. The water applied to almost all of the plats having a soil moisture content above 13 percent wet down 6 ft. or more.

The loss of water from the soil of fall-irrigated land between the time of irrigating in the fall and seeding the following spring was noticeable but usually not important. However, in 1925–26 when the weather between mid-October and early May was very open, dry, and windy, the water loss from a number of plats was about equal to the irrigation application of the previous fall.

A study of influence of depth of ground-water level on yields of crops grown on peat lands, H. B. Roe (*Minnesota Sta. Bul. 330 (1936), pp. 32, figs. 9*).—Investigations are reported which were begun in 1925 and extended through the summer of 1930 to determine the degree of drainage that produced the best practical results with field and horticultural crops commonly grown on peat lands.

Depths of water table 1, 2, 3, 4, and 5 ft. below the surface were secured on definitely limited areas. Control was secured by an adjustable weir in the main tile line downstream from the plat, the water being fed into the soil by a loop of 4- or 5-in. drain tile surrounding the control plat, taking off from and ending in the main above the weir. Depth of water table was measured semiweekly throughout each season from the tops of test wells set in straight lines across each control area at intervals, and elevation of tops of test wells was redetermined several times each season. The data obtained showed control of the ground-water level by this method to be possible within practical limits at any desired depth below the surface, provided the peat is at least as deep as the desired water level, if there is an ample supply of underground water, and if potential settlement of the original bog surface is allowed for in the control works. Control, however, is relatively expensive and can be justified only in the case of special crops yielding a high return per acre.

Settling of the surface of the bog continued for several seasons after cultivation began. It was practically proportional to the depth of water table maintained on the different plats, and usually ranged from 6 in. to 2 ft. Such surface settlement is one of the principal factors determining proper depth of drains in a new bog if the depth of the peat is 4 ft. or more. Over any given control area the surface of the water table tended to remain flat; but heavy rainfall caused temporary upward arching between tile lines, while high water requirement by the plants during July and August depressed it.

The surface was packed with a heavy roller each season before seeding or planting. The packing is essential for satisfactory seed germination, and seems also to aid against summer frosts owing to better heat conductivity of the compacted peat. Fertilizer was applied as follows: 1925, over the entire tract, triple superphosphate at the rate of 400 lb. and muriate of potash at the rate of 200 lb. per acre; other years, for field crops nothing and for truck crops 16 percent superphosphate at the rate of 600 lb. and muriate of potash at the rate of 400 lb. per acre. Careful attention to the use of fertilizer is deemed essential on peat soils, but each bog is an individual problem. The crops raised included sugar beets, field corn, flax, oats, soybean, timothy, and clover hay, snap beans, sweet corn, onions, potatoes, tomatoes, carrots, summer radish, winter radish, cabbage, cauliflower, spinach, lettuce, and celery.

Summer frosts occurred nearly every summer and seriously affected yields of flax, field corn, beans, sweet corn, potatoes, and tomatoes. Soybeans, usually fairly resistant to frost, were seriously damaged by both June and August

frost. Frost damage was greater on the deeper controls owing to the poor heat conductance of the peat soil, indicating that as high a ground-water level as compatible with the crops to be raised is a desirable means of protection. Air drainage was poor, until a solid wall of timber and brush along two sides of the experimental tract was removed, after which summer frosts rarely occurred.

Flax did fairly well the first season, with best results at from 3- to 3½-ft. depth of ground water. It was a failure all other seasons, due largely to weed infestation, although also damaged by summer frosts. Oats was not a satisfactory crop any season at any depth of drainage. This is contrary to the usual experience with oats on peat except where lodging or severe rust occurs. Hay crops, such as soybeans, timothy, and clover, did well, with best yields where drainage was not over 2½ ft. deep after the bog had ceased to settle.

Spinach and head lettuce failed to give any satisfactory results. Failure of spinach, usually a reliable crop on peat soil, is not readily accounted for unless due to unseasonable planting. Climatic conditions in this region are not favorable for production of head lettuce.

After settling of the bog was complete, best results were generally obtained for all other crops in these tests with depths of water table from 3 to 3½ ft. This final average depth, after settlement is practically complete, is recommended where almost any type of crop may be tried at some time.

Soil erosion and stream flow on range and forest lands of the upper Rio Grande watershed in relation to land resources and human welfare, C. K. Cooperrider and B. A. Hendricks (*U. S. Dept. Agr., Tech. Bul. 567 (1937), pp. 88, pls. 20, figs. 15*).—The results reported were secured at the Southwestern Forest and Range Experiment Station, maintained in cooperation with the University of Arizona. A general survey was made of the range and forest lands within the upper Rio Grande watershed, including the erosion conditions in Mesilla Valley, particularly the bordering range lands, below Elephant Butte Dam.

The lands of the Rio Grande watershed, which embraces an area of at least 18,000,000 acres, were originally covered with vegetation varying from semidesert savannas of the lowest plains to coniferous forests of the high mountainous districts. Recent intensive use of the land resources of the watershed have resulted in accelerated run-off and soil erosion, destructive floods, and land deterioration. Evidences of these effects include deeply and continuously channeled alluvial valleys, deep arroyos and wide sand washes where formerly there were only shallow surface runs, gullied slopes, increasing areas or badlands, and altered courses of mountain streams. Other definite manifestations are accumulations of loose stones and sand on the ground surface, soil humps capped by vegetation and remnants of topsoil, shifting sand and sand dunes, and disappearance of luxuriant valley grasses and soils, particularly of the topsoil.

Accelerated run-off and erosion have destroyed numerous primitive irrigation works, are causing the silting up of river channels and water reservoirs, and are resulting in the waterlogging and destruction of productive farm lands. Damaging floods have apparently increased during recent years, and recreational and wildlife resources are being menaced.

The recent general decline of the watershed lands and resources began during the 1880's following the impairment of the natural vegetation cover, principally through overgrazing and also from wanton timber cutting, man-caused fires, promiscuous wagon trailing, and injudicious dry farming. The destructive floodwaters, laden with damaging silt, originate on overgrazed and damaged

range and forest lands. The more the vegetation is injured the greater the degree of accelerated soil erosion.

On only about 25 percent of the lands is there sufficient plant cover to control surface-soil erosion within normal and moderate limits, on about 35 percent accelerated soil erosion is in an advanced stage, and on 40 percent rapid land destruction is in progress. The production of forage has been reduced fully 50 percent, principally as a result of overgrazing and accelerated soil erosion.

The preservation of the land resources in this watershed depends on a protective cover of vegetation. Representative areas on which the vegetation has come back sufficiently to check accelerated soil erosion show that, through protective management, as from overgrazing, impaired vegetation cover on lands not too badly eroded will tend to renew its former protective state. The results also show that the rate of recovery will be determined largely by the quantity of topsoil left and by the precipitation water that soaks into the ground and becomes available for plants during critical periods.

"Principally because of greater annual precipitation and lower mean annual temperature, protective vegetation regenerates more rapidly on lands of the high mountainous districts than on low semiarid lands. Badly eroded spots within an area where vegetation responds quickly to protective management are soon affected by the influence of the recovering vegetation, and for this reason they heal within a comparatively short time.

"Revegetation of seriously damaged lands may be aided through the use of supplementary artificial works which serve, among other ways, in checking run-off, in preventing land break-down in drainageways, and in effecting deposition of silt in which plants may establish themselves. Supplementary works, such as levees and silt-detention dams for protecting farm lands and other properties in the main valleys, are necessary to counteract the damaging effects of accelerated run-off and erosion which result when the protective vegetation of a watershed declines; but they should never be considered an adequate substitute for the vegetation that had heretofore prevented accelerated erosion. The development and maintenance of a protective ground cover will extend the term of usefulness of such works."

Soil and water conservation in the Pacific Northwest, E. M. Rowalt (*U. S. Dept. Agr., Farmers' Bul. 1773 (1937), pp. IV+59, figs. 31*).—This deals with erosion of the soil by wind and water and with measures recommended and employed by the Soil Conservation Service for the control of erosion on the farms and ranges of the Pacific Northwest. It treats particularly of wheat lands and grazing lands.

Since soil conservation is inseparable from water conservation, certain sections deal specifically with the conservation of water for the production of crops on nonirrigated land and the conservation of water for irrigation purposes and for flood prevention. Another section deals with the control of drifting dune sands along the coastal beaches of Oregon and Washington.

Strip cropping for soil conservation, W. V. Kell and G. F. Brown (*U. S. Dept. Agr., Farmers' Bul. 1776 (1937), pp. II+37, figs. 31*).—This reports the results of a study of strip cropping practices now under way throughout the United States and presents information including the latest developments in this field of work. It supersedes Leaflet 85 (E. S. R., 66, p. 875).

The three types of strip cropping discussed are contour strip cropping, field strip cropping, and wind strip cropping.

Public Roads, [July 1937] (*U. S. Dept. Agr., Public Roads, 18 (1937), No. 5, pp. [2]+85–100+[2], figs. 12*).—This number of this periodical contains data

on the status of Federal-aid highway projects and U. S. Works Program highway projects as of June 30, 1937, and an article entitled Laboratory, Exposure, and Simulated Service Tests of Slow-Curing Liquid Asphalts, by R. H. Lewis and W. O'B. Hillman (pp. 85–99).

Use of concrete on the farm, T. A. H. MILLER (*U. S. Dept. Agr., Farmers' Bul. 1772 (1937), pp. [2]+60, figs. 39*).—This discusses the requirements of good concrete for different purposes and describes methods of building some simple concrete structures useful on the farm. It supersedes Farmers' Bulletins 1279 and 1480 (E. S. R., 55, p. 584). It was prepared with the cooperation of the Massachusetts State and North Dakota Agricultural Colleges.

Construction of farm buildings: The use of sun-dried brick, H. W. LANE (*East African Agr. Jour., 2 (1937), No. 5, pp. 381–383*).—This is a brief presentation of information on the use of rammed and sun-dried earth for the construction of farm buildings in Kenya Colony.

Improving the farm wagon, W. P. KINTZLEY and D. P. CRAIG (*Colorado Sta. Bul. 434 (1937), pp. 7, figs. 5*).—A method of low-cost improvement of the horse-drawn wagon for general farm use is briefly described, with explanation of the simple construction necessary to provide rubber tires.

Portable seed cleaning and treating equipment, C. E. SKIVER (*Indiana Sta. Circ. 230 (1937), pp. 10, figs. 4*).—This equipment is described and illustrated and information given regarding its use.

The small farm type fanning mill is hardly adequate to clean the bulky field seeds properly, and receiving separators in the country elevators are regulated for the cleaning of commercial grain stocks and do not clean close enough to make the difficult separations that are necessary for the proper preparation of seed. The portable seed cleaning and treating unit which travels from farm to farm and cleans or treats the seed offers an excellent solution to the problem when properly handled. This portable equipment has the following advantages: (1) It provides the services of improved cleaning and treating equipment, such as the large type fanning mill with traveling brushes, the disk separator, and the automatic treater that most farmers cannot afford to own; (2) it is more economical to transport the equipment to the grain than it is to bring the grain in to a central point (stationary cleaner); (3) it saves labor by making all operations, such as weighing and sacking, automatic; and (4) the portable feature enables the equipment to be utilized for a long period each season, thus warranting the investment.

A seed dropper for cereal nursery rows, L. C. BURNETT (*Jour. Amer. Soc. Agron., 29 (1937), No. 5, pp. 419, 420, fig. 1*).—In a brief contribution from the Iowa Experiment Station a seed dropper is described and illustrated which was adapted from a chain-drive model.

Comparative tests of seed drills used in vegetable production, C. M. AGNEW and H. D. BROWN (*Ohio Veg. Growers Assoc. Proc., 22 (1937), pp. 5–11, fig. 1*).—Investigations conducted at Ohio State University to determine the advantages and disadvantages of several mechanical features of a number of drills are briefly reported, these being preliminary to the development of more effective tools for planting and fertilizing vegetable crops. The results are presented in brief tabular form, but no conclusions are drawn.

Blueberry tillage problems and a new harrow, C. A. DOEHLERT (*New Jersey Stas. Bul. 625 (1937), pp. 12, figs. 4*).—The object of the investigation covered by this report was the development of a practical cultivating tool for blueberries. In experimental work clean cultivation has been found successful as a factor in maintaining large blueberry yields, the benefits being attributed mainly to weed control. However, tillage close to the plant by

means of ordinary cultivators was found impractical after the first two years because of the low spread of the branches of the bushes, and the spread of the tops also indicated the need for a tool of light draft. Root pruning by deep cultivation checked the development of the plants, whereas shallow cultivation was found to conserve the organic matter in the soil. The practice of mounding also presented the need for a tool which is automatically adjustable to varying combinations of sloping and flat surfaces.

A new harrow was developed which meets these requirements. This development is described and illustrated.

Modern equipment for the poultry farm, A. Hay and D. F. C. Vosper (*Rubber Growers' Assoc., Rubber and Agr. Ser. Bul. 7 (1937), pp. [1]+14, figs. 17*).—The essential purpose of this publication is to illustrate the use of rubber on the various types of equipment used around the modern poultry farm in England.

Dairy barn with separate milking room, C. E. Wylie and S. A. Hinton (*Tenn. Univ. Mimeogr. Rpt. 24 (1937), pp. 4, pls. 2*).—This is a brief description of the new dairy barn at the University of Tennessee with its essential accessories.

Sash greenhouses, J. H. Beattie (*U. S. Dept. Agr. Leaflet 124 (1937), pp. 8, figs. 3*).—Practical information is given on the planning and construction of sash greenhouses for use in situations where a forcing structure is needed for a brief period for starting early plants and for similar purposes.

Sash greenhouses are usually constructed of 3- by 6-ft. hotbed sashes with a wooden framework to support them. These structures may be of various sizes, but both width and length are made to suit the 3- by 6-ft. sashes. In general, sash greenhouses are small, as the cost of large ones might easily be as much as that of standard sash-bar structures. The lean-to sash greenhouse built with a roof of sashes against the south side of a building or a tight board fence is the simplest type. Sash greenhouses may be heated by stoves, flue heaters, or steam or hot-water systems.

Illustrations are given of typical structures.

Getting the most effective results from plant refrigeration systems, L. C. Thomsen (*Ice Cream Trade Jour., 33 (1937), No. 5, pp. 23, 24, 38*).—In a brief contribution from the Wisconsin Experiment Station, some of the differences between dairy plant refrigerating systems are pointed out and data on operation analyzed.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Kentucky Station, 1936] (*Kentucky Sta. Rpt. 1936, pt. 1, pp. 7, 8, 9, 10–14*).—Brief general statements are included of findings (1) as to trends of tobacco prices and variations between markets of the State; (2) the more profitable farm practices as shown by farm business surveys of 37 farms in Union County, 50 Inner Bluegrass region farms, and 167 farms in southern Logan County; (3) possibilities of reducing milk cost as shown by a study of unit requirements, costs, returns, and management practices of 16 dairy herds in the Bowling Green area, 8 in the Inner Bluegrass region, and 4 in the Louisville area; (4) methods of distribution, seasonal production, and per capita consumption of milk in Lexington, and the percentages of the total milk supply sold in different forms; and (5) the factors affecting production costs and returns in 111 flocks of lambs in Owen, Grant, Washington, and Meade Counties and the Inner Bluegrass region, and in 40 herds of hogs in Union County and the Inner Bluegrass region.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 187 (1937), pp. 118–124, 126, fig. 1*).—An article on Generalized Land-Use Suggestions for Ohio, by J. S. Cutler, A. H. Paschall, and G. W. Conrey (pp. 118–123) includes some tentative general suggestions for land use in each of the nine districts of the State. The recommendations are based on studies made of soil conservation projects, experiences in CCC camp work areas, and on the cooperative surveys by the U. S. D. A. Agricultural Adjustment Administration and Soil Conservation Service and the station. Similarity of soils, topography, and erosion were the criteria used in determining the district boundaries. A table by J. I. Falconer shows by years 1929–36, inclusive, the estimated number of tons of different commercial feeds reaching the retail trade in Ohio. The table of index numbers of production, prices, and income, by Falconer (E. S. R., 77, p. 551) is brought down through April 1937.

Current Farm Economics, [August 1937] (*Oklahoma Sta., Cur. Farm Econ., 10 (1937), No. 4, pp. 65–85, figs. 4*).—Included are the usual tables of index numbers and review of the agricultural situation and articles on Some Economic Aspects of the Price Paid to Producers for Butterfat in Oklahoma, 1926 to 1935, Inclusive, by A. W. Jacob (pp. 68–71); Quality, Yield, and Production of Cotton in Oklahoma, 1936, by K. C. Davis (pp. 71–74); and The Land Tenure Problem in Oklahoma, by P. Nelson (pp. 74–83).

[Investigations in agricultural economics by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1936], pp. 2–9*).—Some findings not previously noted in studies are included as follows: (1) Number of hens housed in the fall of 1935 as compared with 1934 and the percentage of eggs marketed by different methods in three areas of Rhode Island; (2) average labor incomes of 45 poultry farms in 1935; (3) the receipts of canned milk by rail in Rhode Island in 1933, 1934, and 1935, average daily receipts and sales of fluid milk in the Newport market April 1934 to February 1936, inclusive, and the total receipts in Rhode Island and the percentage of such receipts sold as fluid milk July 1934 to January 1936, inclusive; and (4) the changes in prices of Class I milk, f. o. b. the distributor's plant in Providence, and in the price of dairy rations January 1922 to December 1935, inclusive.

Economic studies of vegetable farming in New York.—I, Market-garden farms with greenhouses, Rochester area, G. A. M. Baptist and E. G. Misner (*[New York] Cornell Sta. Bul. 671 (1937), pp. 51*).—Data obtained in a farm management study covering the years ended March 31, 1933, 1934, and 1935, are analyzed. Seventy-two farms were included in 1933 and 50 each in 1934 and 1935. Tables cover capital invested, receipts, expenditures, operator's labor income, outside and greenhouse crops, sales of crops, amount of livestock, use of fertilizers and manure, prices received, etc. The relations between labor income and size of business, diversity of business, labor efficiency, and efficiency in the use of capital are discussed. "As an average for the 3 yr., each of the following factors contributed to the labor income the following amounts: (1) Capital employed, no change in labor income per increase of $1,000 in capital; (2) receipts per $100 of capital, $91 in labor income for each increase of $100 in receipts per $100 capital; (3) receipts per man, $150 in labor income per increase of $100 in the receipts per man; [and] (4) greenhouse receipts per 100 sq. ft. of greenhouse area, $76 in labor income per increase of $1 in greenhouse receipts per 100 sq. ft. of greenhouse area."

A farm-management-efficiency program for New York market-garden farms is included.

Growers' contracts for sweet corn: An analysis of different types of cannery contracts and the relation of maturity to yields and quality, W. A.

Huelsen (*Illinois Sta. Circ. 472 (1937), pp. 16*).—Using the experimental data previously noted (E. S. R., 77, p. 626), the progressive changes in yields of sweet corn as maturity advances and the bearing of these changes on methods of drawing contracts are discussed.

Farm management for fruit growers, T. E. Lamont and P. S. Williamson (*N. Y. State Col. Agr., Cornell Ext. Bul. 355 (1936), pp. 90, figs. 36*).—This bulletin is devoted chiefly to apple orchard management. Costs of spraying, dusting, cultivating, fertilizing, pruning, etc.; the relation of these factors, age of trees, trees per acre, etc., to yield, and of soil, yields, size of farm, labor efficiency, etc., to costs and returns; and the yields, prices, and returns of important varieties are discussed.

Cost of producing apples in Berrien County, Michigan, 1935, K. T. Wright and W. R. O'Brien (*Michigan Sta. Spec. Bul. 286 (1937), pp. 35, figs. 6*).—Records were obtained from 80 cooperators covering hours of labor spent in apple orchards, amount and cost of all material used, investment in special equipment, numbers of bearing and nonbearing trees, production and value of apples, and conditions and practices followed in the orchard. An analysis is made showing by items the costs of production, marketing, and overhead, and the income, and also of the effects of different factors on costs and returns.

Production costs per acre averaged $36.13, harvesting and marketing costs $37.37, and overhead costs $31.13. The orchards averaged 12.5 acres and the yield 184 bu. per acre. The returns, including appreciation of trees, averaged $106.19. The average profit was $1.56 per acre, or 0.8 ct. per bushel. The 15 most profitable orchards showed a profit of $43.32 per acre, while the 15 least profitable orchards showed a loss of $36.83 per acre. A yield of approximately 200 bu. per acre was necessary to pay costs of production in 1935 if no credit was allowed for appreciation of trees. Orchards with from 35 to 40 trees per acre gave the highest returns. Costs per bushel averaged lowest in orchards of from 10 to 20 acres.

An economic study of grape farms in Schuyler and Yates Counties, crop year 1935, E. G. Misner (*[New York] Cornell Sta. Bul. 670 (1937), pp. 27, fig. 1*).—Records were obtained for the year ended March 31, 1936, for 100 farms with vineyards in Yates County and 81 farms with and 19 farms without vineyards in Schuyler County. An analysis is made to show the capital invested, receipts, expenses, financial returns, the effects of size of business, diversity of enterprises, rates of production, labor efficiency, and efficiency in the use of capital upon operator's labor income. A farm-management-efficiency system for grape farms in the area is included.

Economic aspects of lamb feeding in Michigan, K. T. Wright (*Michigan Sta. Spec. Bul. 284 (1937), pp. 24, figs. 5*).—An analysis is given of 164 lamb feeding cost records covering approximately 130,500 lambs fed during the years 1930–35, inclusive. Tables are included and discussed showing (1) the costs and returns by years and the averages for the period, and (2) the effects on costs and returns of date of purchase, number, source, and initial weight of lambs, length of feeding season, method of feeding, feeding efficiency, death loss, daily gain, and margin between the purchase and selling prices of lambs. The place of lamb feeding on Michigan farms is discussed. Using the results of the analysis, a chart is designed for calculating the feed cost per lamb with concentrates and hay at different prices and one for showing the margins necessary to pay all expenses with different lamb purchase prices and feed costs per fat lamb.

The total cost of fat lambs averaged $6.51 each, of which the cost of feeder lambs made up 63 and feed 31 percent. The average cost of fattening a lamb was $2.44, of which feed constituted 82, use of barn and equipment 6, and labor 5 percent. The average net returns per $1 worth of feed fed ranged from a loss of 5 ct. in 1934–35 to a value of $1.79 in 1933–34, averaging $1.40 for the period. The average feeding period was 110 days, the average gain 26 lb., and the average net return per lamb finished 80 ct. An average of 141 lb. of concentrates and 125 lb. of roughage were fed per lamb.

Feeding ability of the farmer, margin between purchase and sale price of lambs, rate of daily gain, and death loss were the factors of particular importance affecting costs and returns.

Dairy-farm management, L. C. Cunningham (*N. Y. State Col. Agr., Cornell Ext. Bul. 364 (1937), pp. 36, figs. 10*).—This study is based on 2,737 labor income survey records for grade B dairy farms during 1925–34, inclusive. Analysis is made of the amounts and changes in labor income and the effects of size of business, labor and capital efficiency, rate of milk production, egg production, crop yields, and supplementary enterprises on labor incomes.

The average labor income per farm decreased from $715 for the first 5 yr. to $55 for the second 5 yr. In general, the larger the farm business the larger the income, but size had but little effect in years of low prices. Milk production per cow was the most important factor affecting income. Fairly uniform production throughout the year paid better than summer dairying. High crop yields, moderate specialization in dairying, full use of capital, and labor also increased income.

Studies in Vermont dairy farming.—X, Feed as a cost of milk production, G. E. Bond and J. A. Hitchcock (*Vermont Sta. Bul. 421 (1937), pp. 38, figs. 5*).—In continuing the series previously noted (E. S. R., 75, p. 867), an analysis is made of 452 dairy enterprise records for the year ended March 31, 1933, obtained in the Champlain Valley for the purpose of determining the factors affecting winter milk production costs.

Grain fed in the winter averaged 5.2 lb. per cow per day, being 1 lb. for each 2.6 lb. of milk produced. As the amount of grain fed per day increased from about 2 lb. to approximately 6 lb. the average daily milk production rose from 10 to 15 lb. and the net cost of milk production declined. Herds fed over 7 lb. of grain per day per cow averaged little more than 15 lb. of milk per cow and the net cost of milk production was higher. Response to changes in the amount of grain fed and the point at which unit costs of milk were lowest varied somewhat with the season of freshening. Production per cow was lower and the net cost of milk higher on the farms where most of the grain was home-grown than on those where most, or all, of the grain was purchased. Milk yields tended to be higher as the digestible protein content of the grain ration was higher. Silage cost more per hundredweight of digestible nutrients than hay. Production increased as the silage feeding rate rose but not sufficiently rapidly to keep pace with the higher cost of the ration. Production per cow did not vary with differences in rates at which hay was fed, and milk was produced at a lower cost when relatively small amounts of hay were fed.

A survey of research in forest economics (*Social Sci. Res. Council Bul. 24 (1936), pp. VII+52*).—A report prepared under the direction of The Committee on Social and Economic Research in Agriculture.

Agriculture on the Huntley project, P. L. Slagsvold (*Montana Sta. Bul. 342 (1937), pp. 20, figs. 17*).—The soils, topography, climate, water supply, etc., of the project are described. Data are presented in tables and charts and

discussed in regard to size of farms, land tenure, use of lands, acreages and yields of crops, animal units per farm, tax delinquency, value of farm and improvements, sources of farm income, etc.

Systems of farming and possible alternatives in Nebraska, L. F. GAREY (*Nebraska Sta. Bul. 309* (*1937*), *pp. 50, figs. 27*).—This bulletin analyzes in detail the type-of-farming areas of the State previously described (E. S. R., 75, p. 709) and presents methods useful in adjusting production in changing economic conditions. In general, there are included and discussed for each area tables and charts showing the percentages of crop land in different crops and the numbers of livestock units of different kinds by years 1910–34, inclusive; the organization of the most typical farms of different sizes; the cropping system and an alternative cropping system for the most common size farm; and the disposal of feed—farm-grown and purchased—to livestock under the original cropping system. The returns under the original cropping system and one or more alternative plans are discussed.

The relation of size of farm to tax, labor, improvement, and other farm expenses in Nebraska, L. F. GAREY and R. W. HECHT (*Nebraska Sta. Bul. 308* (*1937*), *pp. 24, figs. 6*).—This bulletin is based on information covering the period 1914–34, obtained through farm management surveys and farm account books. Records for 2,097 owner-operated farms, 1,881 part-owner-operated farms, and 2,376 tenant-operated farms were obtained. Tables and charts with discussions show the relation of size of farms, and in some cases cash income, to expenditures for horses and machinery, livestock, feed, grain, and supplies, crop expenses, labor, taxes, and improvements, and also total expenses and fixed and variable expenses. The findings are summarized as follows:

The amount of farm expense varied with the size of business, as indicated by acres per farm and with the amount of cash income from the farm. In the same type of production, large farms had more expense than small farms, although the expenses increased at a slower rate. In general, taxes increased with the size of farm, but the tax per acre decreased. In general, variable expenses resulted in more direct income than fixed expenses. Farmers used their old machinery and improvements when times were bad rather than increase their indebtedness to maintain their capital. When good times returned, the depleted capital was replaced with new and more modern machinery and improvements. The amount of income left after cash expenses had been paid is indicative of the amount left for living and capital obligations. Large farms had not only more total cash income but more for living and capital obligations after the variable expenses were deducted.

An economic study of land utilization in Genesee County, New York, J. N. EFFERSON ([*New York*] *Cornell Sta. Bul. 668* (*1937*), *pp. 42, figs. 19, map 1*).—This bulletin is the seventh in the series previously noted (E. S. R., 76, p. 552). The analysis and discussion follow the same general outline as those in the previous bulletins.

A study of land utilization in Washington and Kent Counties, Rhode Island, B. E. GILBERT (*Rhode Island Sta. Bul. 261* (*1937*), *pp. 32, figs. 6*).—Land cover surveys were made during the years 1932–35, inclusive. Tables and charts show by towns (1) the acreages in different kinds of timber, pasture, hay, different cereals, vegetables, fruits, waste, marsh, etc.; (2) the soil types and estimated acreages of different cover types on the different soils; and (3) estimated acreages of land classified according to suitability for certain uses.

The grazing of maple sugar orchards, J. A. HITCHCOCK (*Vermont Sta. Bul. 414* (*1937*), *pp. 14, figs. 2*).—Data were obtained for 96 farms in northeastern Vermont with sugar orchards regarding land use, livestock pastured, forest

products—sirup, sugar wood, and lumber—and fencing costs, and also regarding sirup production on 125 other sugar orchards in the State.

Sugar orchards occupied one-third of the woodland area on the 96 farms. During the period 1931–36 the value of wood and lumber harvested averaged $147 per farm ($2.05 per acre of woodland) and that of sirup $260 ($11 per acre of sugar orchard). Farm operators estimated it would require an average of 142 rods of fencing per farm and a cost of $2.47 per acre to exclude livestock from their sugar orchards. "Examination of typical orchards indicated that in a very high percentage of them maple reproduction has been destroyed by grazing and that as the present maples mature and are harvested there will be none on the same sites to take their place."

A study of the operation of the 1936 soil conservation program in Vermont, J. A. Hitchcock (*Vermont Sta. Bul. 413* (*1937*), *pp. 14, fig. 1*).—This study was made to identify any factors or characteristics associated or not associated with participation in the 1936 soil conservation program and to examine the effects of the program on the farm practices of the participants. Records of acreages and yields of crops in 1935, of crops, pasture and woodland acreages and numbers of livestock on hand in 1936, and fertilizer applications in 1935 and 1936 were secured for 988 farms in 9 townships scattered throughout the State.

The data indicated that participation in the 1936 program was more general among operators of large farms, among operators handling their farms intensively, and among farm bureau members. Farmers who filled out conservation program work sheets applied 43 percent more commercial fertilizer in 1936 than in 1935, as compared with 21 percent for nonparticipants. The program was also responsible for an appreciable increase in the acreage stocked down.

Financial results of two years' farm operations in New Brunswick I. S. McArthur (*Sci. Agr.*, *17* (*1936*), *No. 3*, *pp. 163–165*).—Tables based on a previous study and records obtained in 1936 for 70 farms in Carleton and Victoria Counties show for 1935 and 1936 the utilization of lands, receipts, expenses, farm income, operator's income, etc.

A study of land utilization, farm production, and rural living [in Antigonish County, Nova Scotia], W. V. Longley and W. F. Chown (*Nova Scotia Dept. Agr. Bul. 118* (*1936*), *pp. 112, pls. 6, figs. 5*).—In this study, made in 1935, the general economic conditions were studied and farm survey records obtained from 163 farms in 10 districts of the county. The types of farming, utilization of land, livestock enterprises, farm income and expense, factors affecting farm living conditions, population and production trends, tax delinquency, schools, communications and services, community organizations, markets and marketing, etc., are discussed.

Land utilization in southwest central Saskatchewan, C. C. Spence (*Sci. Agr.*, *17* (*1936*), *No. 3*, *pp. 157–161*).—Using data from economic surveys made in 1935 and covering 836 farms in 7 rural communities, tables are included and discussed showing the use of land, topography and types of soils of all lands and cropped lands, changes in the use of lands since 1916, and yields, farm prices, and value per acre by years, 1923–34, of fall rye and wheat.

A graphic summary of the value of farm property, B. R. Stauber and M. M. Regan (*U. S. Dept. Agr.*, *Misc. Pub. 263* (*1937*), *pp. II+20, figs. 24*).—This publication, which is based largely on the census of 1930 and 1935, continues the series previously noted (E. S. R., 77, p. 714).

Value of farm land and buildings for North Dakota by counties, 1910–1930, and for United States, 1850–1930; value of farm land alone for

North Dakota by counties, 1920–1930, C. E. Miller, C. Bjornson, and W. Brown (*N. Dak. Agr. Col., 1935, pp. [18], figs. 9*).—The data were obtained chiefly from the Federal census reports and are presented in tables, maps, and charts. Data for North Dakota are also included on the assessed values as shown by reports of the State tax commissioner.

Semi-annual index of farm real estate values in Ohio, July 1 to December 31, 1936, H. R. Moore (*Ohio State Univ., Dept. Rural Econ. Mimeogr. Bul. 98 (1937), pp. 6*).—This is a continuation of the series (E. S. R., 76, p. 260).

[Assessed values and wheat yields, Oneida County, Idaho], P. A. Eke (*Idaho Sta. Bul. 221 (1937), pp. 10–12, fig. 1*).—A table shows the assessed valuations of irrigated and dry farm land, the lands being grouped on the basis of wheat yields and whether or not taxes were delinquent in January 1934.

Improved roads and land values, C. L. Stewart (*Ill. Engin. Expt. Sta. Circ. 27 (1936), pp. 47–64*).—A brief summation is made by European countries and States of the United States of the findings in studies of the effects of improved roads on land values.

Farm tenancy (*Washington: Govt., 1937, pp. VII+28; also in Rural Amer., 15 (1937), No. 3, pp. 3–15*).—This is a message of President Roosevelt, transmitting to the Congress findings and recommendations of the Special Committee on Farm Tenancy and the National Resources Committee.

Protection of agricultural production and of the export of agricultural products in some South American countries: Results of this policy, E. Martinez (*Internatl. Rev. Agr. [Roma], 27 (1936), No. 12, pp. 382E–401E*).—The protection policy and its results in Argentina, Brazil, and Uruguay are discussed.

Sugar: A case study of Government control, J. E. Dalton (*New York: Macmillan Co., 1937, pp. X+311*).—The subject is dealt with in chapters on the point of view; the industry involved; the historical background; the world sugar depression; the national sugar depression; the stabilization agreement—industry's plan; the sugar act—Government's plan; the plan in action—rationalization of marketing; the plan in action—the adjustment of production; the beet sugar industry; the domestic cane sugar industry—Louisiana and Florida; Hawaii, Puerto Rico, the Philippine Islands—the background; the insular areas under the Sugar Act; Cuba; the refiners; the consumer; a brief review; and some wider problems.

Three years of the Agricultural Adjustment Administration, E. G. Nourse, J. S. Davis, and J. D. Black (*Washington, D. C.: Brookings Inst., 1937, pp. XIV+600, [figs. 22]*).—This is the final volume of the series previously noted (E. S. R., 75, p. 413).

The conclusions of the authors "take the form of interpretations of the actual play of economic forces under the new institutional situations, definition of issues, and setting up of alternatives rather than condemnation or recommendation of the AAA in its entirety or even of particular ones of its varied procedures under all circumstances." The chapters deal with agricultural adjustment as national policy; the adjustment act and supplementary laws; administrative set-up; summary view of AAA programs; experience in controlling production; commodity loans and related proposals; commodity purchase and diversion operations; marketing agreements, licenses, and Secretary's orders; administrative problems; effects on farmers' returns; distribution of benefits and burdens among farmers; effects upon farm management and the organization of agriculture; effects upon consumers, the agricultural trades, and taxpayers; contributions to general economic recovery; and AAA philosophy in the light of experience. Supplementary statements by

J. S. Davis and J. D. Black are given. Appendixes include a description, by H. B. Rowe, of the specific analyses used in ascertaining the benefits and burdens of adjustment programs; addresses by the Secretary of Agriculture, H. A. Wallace, on agricultural security, and by H. R. Tolley on soil conservation and agricultural adjustment; and statistical tables.

The Agricultural Adjustment Act and the reports of the Brookings Institution, F. B. GARVER and H. TRELOGAN (*Quart. Jour. Econ., 50 (1936), No. 4, pp. 594–621*).—A review is made of the series of reports of the Brookings Institution previously noted (E. S. R., 75, p. 413) on the dairy industry, wheat, livestock, cotton, tobacco, and marketing agreements under the Agricultural Adjustment Administration.

Who paid the processing taxes—the first time? W. F. FERGER (*South. Econ. Jour., 3 (1937), No. 3, pp. 255–269, figs. 2*).—The author discusses the processing taxes and concludes that "in a realistic sense, and considering the secondary institutional factors in the total situation, nobody paid the processing taxes because of the reconstructive nature of the forces set in motion by the agricultural program. It is not suggested that such an answer disposes of the question of the immediate incidence of the processing taxes. Obviously, at a given time and under given conditions a tax actually collected from a processor comes out of someone's pocket."

Farm cash income in Texas, 1927–1936.—Preliminary report, F. A. BUECHEL (*Austin: Tex. Univ., Bur. Business Res., 1936, pp. [6]+59, [pls. 9, fig. 1]*).—This includes and discusses tables, charts, and maps showing the crop reporting districts of the State, utilization of agricultural lands, monthly prices of farm products, sources of agricultural income (1929), trends and seasonal variation in cash farm income, and the monthly indexes of such income.

Prices in recession and recovery, F. C. MILLS (*New York: Natl. Bur. Econ. Res., Inc., 1936, pp. XV+581, figs. 16*).—This survey of recent changes presents "a monographic treatment of certain aspects of recession and recovery in the United States during the last 7 yr. Various measurements constructed by the National Bureau in connection with its continuing work are of some current interest to economists and others who follow economic movements. Discussion of these and related materials falls easily into half a dozen divisions, dealing with the background of the price recession of 1929, its world setting, and the fortunes of primary producers, fabricators, and consumers during the disturbed years from 1929 to 1936. Although no rounded survey of the situation as a whole is made, something of unity in the price history of these various groups is found in tracing the incidence of productivity changes in manufacturing industries and their relation to changing costs and prices. This topic is developed in the final chapter."

The material is presented in chapters on general aspects of recent price movements, the prerecession situation, price movements and related economic changes during recession and depression, the world price structure in recession and recovery, price changes and the fortunes of primary producers in recovery, manufacturing industries in recovery, capital equipment and construction in recovery, consumers' goods in recovery, and the price system, increasing productivity, and recent economic changes.

Prices of North Dakota farm products, 1929–1935, C. E. MILLER and C. BJORNSON (*N. Dak. Agr. Col., 1935, pp. [12]*).—The tables of monthly prices previously noted (E. S. R., 62, p. 783) are brought down through June 1935.

The farmer looks ahead: Four yardsticks for measuring future farm production (*U. S. Dept. Agr., Farmers' Bul. 1774 (1937), pp. 16, figs. 7*).—The

size of the agricultural production, 1928–32, and the amount that should be produced in the future are discussed. The proper future production is measured by the requirements of domestic consumption, foreign demand, the need for soil conservation, and the production that will give the greatest farm income.

Grade, staple length, and tenderability of cotton in the United States, 1928–29 to 1935–36 (*U. S. Dept. Agr., Statis. Bul. 60 (1937), pp. 60, figs. 10*).—This bulletin continues the series previously noted (E. S. R., 77, p. 719). Detailed tables are included for the 1935 crop year and more general tables for preceding crops.

Cotton bale enquiry (*Internatl. Cotton Bul., 15 (1937), No. 58, pp. 213–245*).—Analysis is made of the answers to an inquiry sent out by the *International Federation of Master Cotton Spinners' and Manufacturers' Associations* regarding weights, densities, measurements, details of covering and banding, etc. Tables present data by countries as to measurements, weights, and density of cotton bales; types of and weights and yardage per bale of covering; numbers, dimensions, weight, and method of fastening bands, ties, and wires; and types of gins, place of pressing bales, range of lengths of staple, export taxes, and volume of exports.

Fruits and vegetables: Agricultural income inquiry (*Washington: Govt., 1937, pp. V+16*).—This interim report of the Federal Trade Commission includes its conclusions and recommendations as to terminal market inspection, loss and damage claims, unfair rejections, failure properly to account to shippers, misbranding, terminal cartage, terminal facilities, and cooperative marketing. Appendixes include Public Resolutions 61, 86, and 112 of the Seventy-fourth Congress.

Market outlets for Minnesota fruits, J. D. Winter, W. C. Waite, and W. H. Alderman (*Minnesota Sta. Bul. 332 (1937), pp. 36, figs. 8*).—The findings in a preliminary study of the marketing problems of Minnesota-grown fruits, with special reference to their utilization in commercial manufacture, are presented. The commercial production of raspberries and strawberries in Minnesota in 1935 and 1936, the methods of distribution, the volume used in the manufacture of jam and preserves and ice cream, as crushed fruit for soda fountain trade, in the baking industry, and for commercial canning, are discussed. The changes in variety or improvement in quality necessary to increase the use of strawberries and raspberries for commercial manufacture, the use of Minnesota apples, plums, and grapes for commercial manufacture, and the value of Minnesota apples for commercial baking are also discussed. The established grades and legal requirements for berries are described. Some of the findings were as follows:

Almost the entire crop of Minnesota-grown raspberries and strawberries is sold as fresh fruit for table use and home canning. Less than 2 percent of the sum expended by commercial factories in Minnesota for raspberries and strawberries is spent for Minnesota-grown berries. There is a wide market for Minnesota-grown raspberries in the preserving industry at prevailing prices for preserving berries. There is opportunity for the development of a market for Minnesota strawberries in the ice cream business, but no sizable market for raspberries in that industry. Factory tests of the Dolgo crab, Hennepin plum, and Sapa cherry-plum showed that they are very satisfactory for commercial preserves and jelly. Most of the 14 varieties of apples tested were satisfactory for the commercial pie industry and one, Minnesota No. 790, was entirely satisfactory for the baked apple trade.

Marketing apples in the Champlain Valley, G. P. Scoville (*[New York] Cornell Sta. Bul. 669 (1937), pp. 41, figs. 11*).—The varieties of apples grown, grades sold and prices received, markets, seasons, and methods of marketing, storage, transportation, packing, and commission costs are described and discussed. The more detailed data used covered the years 1933–35, inclusive. Some comparable data are also included for Ulster and Niagara Counties and the Hudson Valley, and some data as to New York City prices. The effects of deflation in selling prices of apples, costs of marketing, and returns to growers are briefly discussed.

Frozen-pack fruit markets, H. Carlton (*Tennessee Sta. Bul. 161 (1937), pp. 72, figs. 10*).—This study deals principally with strawberries and was undertaken primarily for the purpose of locating additional markets for Tennessee strawberries. Other frozen fruits and certain vegetables are also included because of their competition with strawberries or as desirable products for Tennessee growers and processors. The field work was done between June 15 and December 15, 1935, and the reports and estimates are based on a combination of the 1934 and 1935 packs.

"Consumers, processors, cold storage operators, brokers, jobbers, wholesalers, and retailers in the large consuming centers were interviewed, and trade publications and associations and individuals familiar with the food industry were consulted for general information. Agricultural experiment stations and State and Federal departments were visited for experimental, processing, and statistical information."

The bulletin covers, among other things, the production and consumption of frozen-pack fruits in the United States and Canada; the areas of production; important markets; varieties of fruit used; the use of frozen-pack fruits in the preserve, ice cream, and pie industries, in institutions, and for home consumption; types of containers used; methods and cost of transportation; cost of packing, storing, etc.; selling prices; etc.

The methods of cold-packing strawberries and varieties and types of berries found most satisfactory are discussed. Similar brief descriptions are included for other fruits, especially peaches and cherries. The increasing demand for frozen fruits and vegetables for institutional and retail trade is also discussed. A chart shows the normal packing periods for different fruits and vegetables in the Pacific Northwest States and Tennessee.

Country milk-receiving and cooling stations, C. E. Clement (*U. S. Dept. Agr. Circ. 432 (1937), pp. 60, figs. 32*).—This circular, which applies chiefly to stations from which all milk is shipped as market milk, presents information as to the construction, arrangement, operation, volume requirements for economical operation, labor requirements, methods of transportation, etc., of country receiving and cooling stations, and the relative advantages and economies of such stations as compared with direct shipment. Plans are included for the construction of plants of various capacities.

Co-operation and the new agricultural policy (*London: P. S. King & Son, 1935, pp. VIII+136*).—This volume, prepared by the Horace Plunkett Foundation, describes the historical and legal background of cooperation in England, Scotland, and Northern Ireland in different agricultural commodities; includes a classification of agricultural planning in 1935 and an assessment of results; and discusses the new British policy and the organization of agricultural marketing in overseas countries resulting from the altered British market or the impulse to meet falling agricultural prices by organizational or restrictive measures.

Agricultural co-operation in Fascist Italy, with a full account of the general organization of co-operation, F. Cotta (*London: P. S. King & Son,*

1935, pp. XVII+148).—The subject is dealt with in chapters on the genesis of the present organization, legislation governing cooperation, the Fascist National Organism of Cooperation, agricultural labor and cultivation societies, collective purchase and marketing societies, processing societies, rural or agricultural credit societies, cattle insurance societies, national federations, the Italian Federation of Agricultural Consortia, and propaganda and education, and a chapter summarizing the author's findings as to how Italian cooperation stands in the light of orthodox cooperative principles and of present-day practice and economic requirements.

Consumers' cooperation throughout the world in 1935 (*U. S. Dept. Labor, Bur. Labor Statis., Mo. Labor Rev., 44 (1937), No. 1, pp. 79–95*).—Tables are included and discussed showing by countries the number and membership of retail, wholesale, credit, productive and labor, housing and construction, agricultural, and miscellaneous associations.

Agricultural statistics, 1937 (*U. S. Dept. Agr., 1937, pp. [1]+486*).—This volume, prepared under the direction of J. A. Becker et al., the Yearbook statistical committee, continues the series previously noted (E. S. R., 76, p. 124). It includes statistics of different grains, cotton, sugar, tobacco, different fruits and vegetables, miscellaneous crops, beef cattle, hogs, sheep, horses, mules, dairy and poultry, foreign trade in agricultural products, farm business and related subjects, and miscellaneous subjects such as forestry, weather, roads, etc.

The first world agricultural census (1930), A. Brizi (*Roma: Internatl. Inst. Agr., 1936, prov. ed., pp. [VII]+229*).—This is "a methodological study of the questions contained in the forms adopted for the purposes of the census in the various countries." General information is given as to the countries taking part in the census and the procedure in each. The questions proposed in the standard form, in the appendix to and supplementary to that form, and questions not included in the standard form but occurring in the schedules of certain countries are discussed. The standard form is given in the appendix.

RURAL SOCIOLOGY

Recent changes in the social and economic status of farm families in North Carolina, C. H. Hamilton (*North Carolina Sta. Bul. 309 (1937), pp. 180, figs. 59*).—The depression is credited with the displacement, unemployment, and impoverishment of thousands of farm families; a back-to-the-(poorest)-land movement; an increase in farm tenancy in western North Carolina, a region of traditional home ownership; a repression of the natural ambitions and functions of the rural youth on farms; a curtailment in normal governmental and other social institutions; and the loss of faith in traditional capitalistic, social, and economic institutions.

This study shows that "the AAA was definitely not to blame for increased displacement of tenants and croppers. Except in a few areas, the curtailment in cotton and tobacco acreage was accomplished not by eliminating farmers but by reducing the average number of acres per farmer."

There is, even in normal times, a constant movement of farmers up and down the agricultural ladder. The rural birth rate fell very little if any at all during the depression, and there is some indication that it has turned upward or at least leveled out during the years 1933, 1934, and 1935. There is some evidence that farm tenancy is, over a long period of time, increasing rather than declining. Another long-time trend is the accelerated drift of Negroes out of agriculture during the past 5 yr.

Promising signs are rural electrification, better rural schools, lower birth rates, less infant mortality, and better rural health organization. "A new agricultural program and the resettlement program also holds great promise for saving the land and the people."

Rural population and community studies (*Kentucky Sta. Rpt. 1936, pt. 1, pp. 9, 10*).—In 12 school districts in the Eden Shale area of Anderson County factors in the migration of young persons from this county were studied.

The relief problem in Montana: A study of the change in the character of the relief population, C. F. KRAENZEL and R. B. MCINTOSH (*Montana Sta. Bul. 343 (1937), pp. 64, figs. 12*).—This study includes the extent and trend of relief in Montana, characteristics of the relief population, family composition of relief households, age and sex distribution of relief compared with the non-relief population, and the occupational history of heads of relief households.

A study of the characteristics and occupations of 1,100 part-time Rhode Island farmers (*Rhode Island Sta. Rpt. [1936], pp. 35–38*).—Data are included on the extent to which rural living and the production of farm produce for home consumption and for sale are combined with occupation in nonagricultural enterprises and on the composition and characteristics of the families studied, with some general facts relative to their diets and households.

Recreation and the use of land in Washington County, W. R. GORDON and B. E. GILBERT (*Rhode Island Sta. Bul. 258 (1937), pp. 83, figs. 27*).—This is an inventory of the real estate used for recreational purposes. The field work was done in 1934. Measured in extent of land use, agriculture has been declining in the county since 1880, with either reversion to woodland or development for country estates, suburban homes, or summer residences. The development of industry, the concentration of population in the Northeastern States, and improved transportation combined with the natural advantages of location, climate, seashore, inland ponds, and woodland have all had their influence in extending the use of land for recreational purposes. Of the total land area in the county, 10.46 percent is now in recreational use. Considering the eight types of recreational use, summer residences command 65.4 percent of all recreational land, with recreational clubs 11.3 percent and public parks 10.9 percent. Privately-owned recreational land constitutes 88.34 percent of the total recreational acreage. On the basis of assessed valuation, this privately-owned recreational land represents 37.25 percent of the county's total, while the average per acre figure indicates that it ranks with the most valuable land in the county.

The total gross valuation of all recreational real estate amounted to $17,010,351, or approximately 35.39 percent of the county total. Summer residence property accounts for 90.92 percent of its total valuation, with summer hotels the next class. "The recreation industry is of notable importance measured solely on the basis of its use of land, and there is justification for the belief that such use is destined to increase in the area studied."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

[Proceedings of the fiftieth annual convention of the Association of Land-Grant Colleges and Universities], edited by W. L. SLATE (*Assoc. Land-Grant Cols. and Univs. Proc., 50 (1936), pp. 376*).—This is the report of the convention held at Houston, Tex., November 16–18, 1936, and previously discussed (E. S. R., 76, pp. 1, 144, 145). Included are the papers and discussions thereon presented in the general sessions of the Association, in the joint sessions of the section on agriculture and the subsections on resident teaching, experiment station work, and extension work, and in the sections on engineering and home economics. Also included are the minutes of the executive body of the Associa-

tion, the minutes of the conference of deans of graduate schools, reports of committees, the constitution of the Association, and lists of officers and committees for the succeeding year.

History of the Agricultural and Mechanical College of Texas, C. OUSLEY (*Tex. Agr. Col. Bul., 4 ser., 6 (1935), No. 8, pp. [3]+172, figs. 4*).—The history of the administration and teaching, experiment station, and extension work of the college are discussed.

Statement of policies for the administration of vocational education (*U. S. Dept. Int., Off. Ed., Vocat. Ed. Bul. 1* [3.] *rev. ed. (1937), pp. IX+137*).—"Part 1 of this publication [E. S. R., 38, p. 597] describes briefly the administrative relationship established between the States and the Federal Government under the vocational education acts for the promotion and development of the cooperative program of vocational education in the States; and also includes in outline form the legal requirements imposed by the Smith-Hughes and George-Deen Acts. Part 2 comprises general policies or standards adopted by the Office of Education. Part 3 discusses specific questions of administration of the vocational education program raised from time to time in conferences with representatives of State boards for vocational education or which arise in the day-to-day administration of the act, and explains the rulings adopted on these questions."

Appendixes include (1) the texts of the vocational educational act approved February 23, 1917 (Smith-Hughes Act), the vocational rehabilitation act approved June 2, 1920, the vocational education act approved June 8, 1936 (George-Deen Act), amendments to these acts, and acts providing for vocational education and rehabilitation in Hawaii, the District of Columbia, and Puerto Rico; (2) tables showing the grants and allotments available under the several acts; and (3) a topical outline for State plans for a 5-yr. period, July 1, 1937–June 30, 1942.

Southern field-crop enterprises (*Chicago: J. B. Lippincott Co., 1937, 2. ed., rev., pp. XXVII+574, figs. 282*).—The tabular and other data, reference lists, etc., in this textbook (E. S. R., 61, p. 290) have been revised. New sections on soils and other plant relationships, conservation and improvement of soils, land drainage, and prevention of soil erosion—terracing—are included. The sections were written by the following authors, with the assistance of subject matter and vocational education specialists: Cotton enterprise, by E. R. Alexander; corn, by D. M. Clements; small grain, by E. G. Matthew; sorghum, by E. B. Nelms; grass and clover, by Z. M. Smith; alfalfa, by R. I. Throckmorton; peanut, soybean and cowpea, and other annual legumes, by W. S. Newman; Irish potato, by J. K. Coggin; sweetpotato, by W. H. Garrison; tobacco, by F. G. Burd; rice and sugarcane, by J. G. Lee, Jr.; and truck crops, by E. W. Garris.

The feeding of crops and stock, I–III, A. D. HALL (*London: John Murray, 1937, 2. ed., [rev.], pts. 1, pp. IX+120, figs. 18; 2, pp. IX+122, figs. 9; 3, pp. XI+108, figs. 5*).—This introduction to the science of the nutrition of plants and animals is a revision and enlargement of the book previously noted (E. S. R., 25, p. 626), the three parts being published separately. Part 1, The Plant, includes chapters on what the plant is made of, the work of the leaf, the work of the roots, changes of composition within the plant, and reproduction. Part 2, Soils and Fertilizers, includes chapters on the origin and nature of soils, cultivation and the movements of soil water, the living organisms of the soil, fertilizers and manures, and the improvement of soils. Part 3, The Nutrition of Animals and Man, includes chapters on the animal, energy required for maintenance, the productive ration, feeding for production, the composition of feeding stuffs, food accessories, rations for livestock, valuation, and human

Elements of statistics, H. T. Davis and W. F. C. Nelson (*Bloomington, Ind.: Principia Press, Inc., 1937, 2. ed., rev., pp. XII+434, figs. 510*).—This text is designed for a 6 to 9 semester-hour course for students of the social sciences. The illustrative materials and problems are taken chiefly from data of economic significance. The plan is "to interpret statistical science so far as this is possible under the assumption that the reader is equipped only with a good knowledge of college algebra."

The several chapters include preliminary analysis of statistical data, the graphical analysis of data—elementary curve fitting, methods of averaging, index numbers, the analysis of time series, analysis of artificial data—probability, binomial frequency distributions, the normal frequency curve—problems in sampling, curve fitting, elements of correlation, multiple and partial correlation, and types of statistical series. Appendixes include biographical notes on early mathematical economists, an explanation of logarithms, a brief exposition of the use of tables, and a number of mathematical and statistical tables.

FOODS—HUMAN NUTRITION

[Food and nutrition studies of the Massachusetts Station] (*Massachusetts Sta. Bul. 339 (1937), pp. 23, 24, 34, 35, 67–71, 72, 73*).—Included in this progress report are summaries of studies, several of which represent a continuation of earlier work (E. S. R., 75, p. 563), by W. B. Esselen, Jr., and J. E. Fuller on the effect of raw, pasteurized, and iodized milk on the fecal flora of white rats (pp. 23, 24); by W. S. Ritchie, G. C. Crooks, and C. R. Fellers on the chemical composition and nutritive value of haddock as affected by different freezing methods (pp. 34, 35); by H. S. Mitchell and G. M. Cook on the cause and control of nutritional cataract (p. 67); by Mitchell and M. Goldfaden on the source and amount of iodine effective in the prevention of the pathology produced in rabbits and guinea pigs by feeding cholesterol (p. 68); by Cook on the use of banana and milk in diets for weight control (p. 68); by Fellers, J. A. Clague, and A. S. Levine on apples and apple products (p. 69); by Fellers, C. F. Dunker, and D. DeFelice on the stability of vitamin C in sweet corn, lima beans, and spinach preserved by cooking, canning, and freezing (pp. 69, 70); by O. Merriam and Fellers on the vitamin content and other nutrition studies with blueberries (p. 70); by Fellers, W. A. Maclinn, and Levine on processing methods in home canning (p. 70); by Maclinn, Fellers, and R. C. Buck on tomatoes and tomato juice as antiscorbutics (p. 70); by Esselen and Fellers on the reliability of the dealers' guarantees of the vitamin D content of vitamin D milk in the State (p. 71); by Fellers, Clague, and D. A. Bean on the vitamin A and D content of whiting-liver oil (p. 71); by Fellers, V. Jancik, and Levine on the preservation of sweet peppers, melons, and cucumbers by salting and fermentation (p. 71); by K. Newman, Fellers, and M. J. Mack on the use of dextrose as a partial substitute for sucrose in the preparation of crushed fruits and sirups (p. 72); by Fellers, Clague, Esselen, and Levine on the preparation of cranberry juice and cordial (p. 72); by Esselen and Fellers on the influence of iodine and vitamin D on scurvy in guinea pigs (p. 72); and by Esselen, B. Isgur, and Fellers on the effect of variety and stage of growth on the vitamin A, C, and D content of corn (p. 73).

Recent developments in the chemistry of storage and preparation of foods, M. A. Barmore (*Food Res., 1 (1936), No. 5, pp. 383–398*).—In this contribution from the Colorado Experiment Station, the author lists a few recent advances "from the 'art' to the 'science' stage" in food preparation and reviews recent advances in four fields of research in which there has recently been marked progress—storage of eggs, storage of potatoes, rancidity of fats and

oils, and pectin in its relation to jelly making. An extensive bibliography is appended.

Steam pressure method of canning necessary for high altitudes, W. V. Halversen (*Idaho Sta. Bul. 221 (1937), pp. 26, 27*).—Data are presented on the time in minutes necessary to destroy spores of *Clostridium botulinum* in seven fruits and vegetables at pH varying from 3.60 to 6.95 and temperatures of from 90° to 115° C. It is recommended that at 90°, which corresponds to the boiling point of water at an altitude of 9,000 ft., the following processing times should be substituted for the exposures given in the commercial time tables: For hominy 10 hr., corn 9¼, spinach and beans 8½, pears 2¼, and prunes 1 hr.

The effect of temperature and time of cooking on the tenderness of roasts, S. Cover (*Texas Sta. Bul. 542 (1937), pp. 61, figs. 6*).—In this study the well-done roasts were cooked in a gas oven at constant temperatures of 125° and 225° C. to an internal temperature of 80°. Rib, round bone chuck, and rump roasts of beef, a half-ham roast of pork, and a leg of lamb roast were used. In a second series rib and round bone chuck roasts of beef were cooked to an internal temperature of 55° when the oven temperature was 125° and to 45° when the oven temperature was 225°, so that a maximum internal temperature close to that for medium rare (63°) was attained.

The results from the paired eating method (E. S. R., 76, p. 126), according to a panel of 12 judges, show that the well-done roasts may be grouped into three classes: The round bone chuck and rump roasts, which had the largest percentage of judgments in favor of the low oven temperature, the half-ham of pork and the rib roasts, which had a lower majority, and the leg of lamb, which had no significant majority in favor of the low oven temperature. Interpretations of the corresponding time-temperature curves for each of these cuts and of the difference in total cooking time between the high and low oven temperature methods give similar groupings. Contrary to the results with the other roasts, the time-temperature curves for the chuck and rump roasts cooked at the lower oven temperature flatten very abruptly at about 63°, and at least half of the total cooking time is required to raise the internal temperature from the medium to the well-done stage. The flattening affords evidence of either a chemical or physical change, accompanied by the absorption of heat in the internal temperature range between approximately 65° and 75°. A comparison of the roasts cooked to the medium rare stage showed no significant differences in tenderness either between the two cuts cooked at the same temperature or between the two methods of cooking. "The differences in tenderness, which in these tests have appeared to be related to oven temperature, seem to be explained in a more satisfactory manner on the basis of the length of time required for cooking." It would appear that the possibilities of obtaining a tender roast are greater when a low oven temperature is used.

Nutritive value of the blue crab (Callinectes sapidus) and sand crab (Platyonichus ocellatus Latreille), V. K. Watson and C. R. Fellers (*Amer. Fisheries Soc. Trans., 65 (1935), pp. 342–349, fig. 1; abs. in Massachusetts Sta. Bul. 339 (1937), p. 95*).—In this contribution from the Massachusetts Experiment Station, the literature on the composition and nutritive value of crab meat is reviewed and proximate and mineral analyses are reported on the edible meat of the blue crab and the sand crab. Data are also reported on the biological value of the proteins of the two species. With the exception of one lot of solidly frozen meat of the sand crab, the samples used for the analyses were of fresh unfrozen material. In the biological tests one sample of canned blue crab and three of frozen were used. All samples were dehydrated in a current

of air on large shallow glass pans in an oven at a temperature of from 95° to 104° F., ground to a fine powder, and stored in sealed glass bottles until used.

The meat from both species was very similar in composition, but differed from animal meat in having a high ash content and high alkalinity of the ash. The caloric values were moderate, 77.2 and 89.8 calories per 100 g, wet basis, for the blue crab and sand crab, respectively. The fat content was low, 0.39 and 0.24 percent, respectively. Values for the more important mineral elements were calcium 0.133 and 0.134, phosphorus 0.038 and 0.047, iron 0.002 and 0.0015, and copper 0.0013 and 0.0012 percent, respectively. Iodine values were 322 and 464 parts per billion.

In feeding experiments on young rats, crab meat fed at a 9 percent protein level in diets considered adequate in all other respects proved definitely superior in growth-promoting properties to either technical or vitamin-free casein. The sample of canned crab meat, while superior to casein, was definitely inferior to two samples of frozen blue crab and one of frozen sand crab meat.

Milk, N. N. Godbole (*Benares, India: Author, 1936, pp. [2]+XVII+139, pls. 11*).—The purpose of the book is to disseminate a correct knowledge of milk as the most perfect food. The uses of milk and milk products are presented, with tables on the composition of different types of milk, butter, cheese, cereals, pulses, fruits and vegetables, and animal and vegetable foodstuffs. A foreword by M. M. Malaviya is included.

Nutritive value of chocolate flavored milk, W. S. Mueller and W. S. Ritchie (*Jour. Dairy Sci., 20 (1937), No. 6, pp. 359–369, figs. 3*).—In an experiment conducted by the Massachusetts Experiment Station, four groups of rats were fed ad libitum mineralized whole milk diets containing no cocoa and 4, 7, and 10 percent of cocoa, respectively. Under these conditions the rate of milk consumption and the average daily gain in weight decreased as the percentage of cocoa increased. In other experiments with rats on a whole milk powder-cane sugar basal diet to which cocoa was added at the rate of 0, 1, 2.5, and 4 percent, respectively, on a fluid milk basis and employing the principle of paired feeding, the 1-percent cocoa diet was equal to the whole milk diet; the 2.5-percent cocoa ration gave a questionable retardation of growth; and the 4-percent cocoa diet definitely retarded growth. The results obtained failed to determine the specific factors responsible for this retardation in growth. Feeding 7- or 10-percent cocoa resulted in the feces in the intestinal tract being very hard. There were no significant changes in the bacterial flora of the intestines for the whole milk and the 1- and 4-percent cocoa diets, and adding 1-percent cocoa had no significant effect on the fecal pH.

Composition and nutritive studies on blueberries, O. A. Merriam and C. R. Fellers (*Food Res., 1 (1936), No. 6, pp. 501–512; abs. in Massachusetts Sta. Bul. 339 (1937), p. 98*).—In continuation of a previous study (E. S. R., 70, p. 277) at the Massachusetts Experiment Station, the authors report chemical analyses of fresh and moisture-free blueberries of wild highbush (*Vaccinium corymbosum*) and lowbush (*V. pennsylvanicum*) species native to Massachusetts and Maine, and four varieties of cultivated blueberries grown in Massachusetts and New Jersey. The vitamin A content was determined by the U. S. P. Revision (1934) technic, with the fresh blueberries fed at the 3- and 5-g levels and the dried blueberries at the 0.5-g level. The biological assay for vitamin C was again made by the Sherman-LaMer-Campbell method on fresh blueberries in season and on solidly frozen fruit, some samples of which had been defrosted and refrozen, during the remainder of the study,

and on kettle-cooked canned wild blueberries. The ascorbic acid content was determined by the Bessey and King titration technic (E. S. R., 71, p. 137).

The moisture content averaged 84 percent in wild highbush and from 76 to 85 percent in three varieties of cultivated highbush blueberries. The soluble solids (sugars) in the fresh fruit had a mean value of 11.6 percent, and the ash analysis showed the presence of from 1.25 to 1.58 percent of the usual minerals found in plant tissues, with a definite excess of alkaline elements. The protein content on the moisture-free basis varied from 3.14 to 4.69 percent, the fat content from 2.13 to 4.69, and the fiber content from 5.16 to 12.58 percent.

Limited data from the vitamin A determinations show a content of approximately 1 international unit per gram. Unless defrosted and refrozen, the frozen blueberries were found to be as good a source of vitamin C as the fresh fruit, with an estimated protective dose ranging between 7 and 10 g. From 10 to 20 g was the protective dose for the kettle-cooked canned blueberries. Very slight varietal differences were noted among the cultivated fruits, with the Rubel and Cabot varieties slightly higher in ascorbic acid content than the Harding and Pioneer. The four cultivated varieties ranged from 1 to more than 1.3 and the wild blueberries, when frozen or canned, from 0.5 to 1.6 international units of vitamin C per gram. It is concluded that blueberries are only a fair source of vitamins A and C.

Neither the blood alkaline reserve nor the urinary acidity was affected by the ingestion of 300 g of fresh blueberries daily by two adult males. The benzoic acid content of two lots of wild highbush blueberries was approximately 0.002 percent. See also previous comparable work with cranberries (E. S. R., 70, p. 866; 72, p. 191).

A system of judging flavour in bread, A. M. Maiden (*Jour. Soc. Chem. Indus., Chem. and Indus., 55 (1936), No. 8, pp. 143–145, fig. 1*).—In the method described for investigating the effect of adding various substances to bread, the flavor was divided into (1) the strength of the smell, (2) the desirability of the smell, and (3) the desirability of the taste, with emphasis placed on the first two factors. The panel of judges was selected from the results of a test in which they placed loaves of bread containing varying amounts of ground-up crust to alter the strength of the flavor, in order of strength of smell. Two-lb. loaves baked in closed tins were found to be more uniform in flavor than those baked in open tins. The bread was judged when about 18 hr. old and not more than four persons judged one loaf.

The method was successfully applied to a study of the effect on bread flavor of acetylmethylcarbinol and diacetyl. No increase was found in the desirability of the flavor of the bread by the addition of either substance. It is concluded that neither of these substances is responsible for the normal flavor of English bread.

Homemade bread, cake, and pastry, F. B. King and A. B. Freeman (*U. S. Dept. Agr., Farmers' Bul. 1775 (1937), pp. II+30*).—In this bulletin, which is a revision of and supersedes Farmers' Bulletin 1450 (E. S. R., 54, p. 86), the materials used in bread, cake, and pastry making are discussed and 33 recipes are given, together with score cards for use in judging home baked products.

Growth and basal metabolism, V, VI, I. Nakagawa (*Amer. Jour. Diseases Children, 53 (1937), No. 4, pp. 985–999*).—In continuation of the series previously noted (E. S. R., 74, p. 129), two papers are presented.

V. *Basal metabolism of high school children* (pp. 985–990).—This report covers a study of the basal metabolism, as determined in the spring of the year by the technic previously described (E. S. R., 72, p. 721), of 23 healthy Japanese children between the ages of 12 yr. 1 mo. and 15 yr. 3 mo. Data on the physical

characteristics of the children are given. Coefficients of correlation between the total heat production and the physical factors weight, height, and surface area were determined from the data of various authors for children at puberty.

Comparing the average number of calories per square meter per hour as calculated by these authors will give a general view of the basal metabolism at puberty, but due largely to the small number of cases studied considerable discrepancy exists between their results. No conclusion is drawn as to which of the physical factors is the best for expressing the basal heat production of children at puberty.

The total heat production of Japanese high school children is low in comparison with the Talbot standards.

VI. *Changes in the basal metabolism of children during puberty* (pp. 991–999).—Following the method previously described, the basal metabolism, together with the body weight and height, of 24 Japanese children aged from 3 yr. 7 weeks to 13 yr. 4 mo. was studied every 6 mo. throughout the pubertal period. All tests were made in the spring and autumn seasons. The coefficients of correlation between the total heat production and the physical factors weight, height, and surface area were determined for the individual children.

An increase in total heat production was noted, beginning at the age of 11 or 12 yr. in the boys and 10 or 11 yr. in the girls and reaching the maximum at the age of 12 or 13 yr. in the boys and 11 or 12 yr. in the girls. The increase in weight and height continued until the age of 15 or 16 yr. in the boys and 14 or 15 yr. in the girls. In the individual children the physical factor weight was most closely correlated with the total heat production, but no conclusion was reached as to which factor is the best for expressing the amount of heat produced. The increase in the total heat production, which probably occurs in preparation for the physical changes which take place at puberty, reached the maximum at the average age of 14 yr. for the boys and 13 yr. for the girls, which is consistent with the earlier pubescence of girls.

The basal metabolism of normal boys and girls from two to twelve years old, inclusive, R. C. Lewis, G. M. Kinsman, and A. Iliff (*Amer. Jour. Diseases Children, 53 (1937), No. 1, II, pp. 348–428, figs. 30*).—The results of 366 basal metabolism tests on 52 boys and 271 on 41 girls, aged from 2 to 12 yr., inclusive, are presented. The open circuit chamber method was followed, using the Carpenter-Haldane gas analysis apparatus. The amount of heat produced was expressed as calories per hour referred to age, weight, height, and surface area, respectively, and as calories per hour per square meter of surface area, per kilogram of body weight, and per centimeter of total height, respectively, referred to age. A detailed review of the literature covers basal metabolism studies on approximately 2,000 normal children within the age group of 2–12 yr., and the data reported by the various investigators were analyzed in relation to the central trend values obtained by the authors.

Statistical analyses showed that the mean coefficients of variation were lowest when the amount of heat produced was expressed as calories per hour referred to surface area for the boys, and calories per hour referred to weight for the girls, with the second lowest degrees of dispersion resulting in both groups when the heat production was expressed as calories per hour per square meter referred to age. These three sets of central trend line values are recommended as prediction standards and may be used equally satisfactorily for computing the basal metabolic rate of children aged from 2 to 12 yr., inclusive.

Basal metabolism of girls: Physiologic background and application of standards, F. B. Talbot, E. B. Wilson, and J. Worcester (*Amer. Jour. Diseases Children, 53 (1937), No. 1, II, pp. 273–347, figs. 10*).—Statistical and clinical

analyses were made on groups of data, and basal metabolism standards were selected for girls from 12 to 20 yr. of age. The technics of various investigators and the effects of cretinism, hyperthyroidism, malnutrition, and obesity on basal metabolism are discussed. Comparisons were made with predictions obtained from the average weight standard proposed by the authors and the Aub-Du Bois and Harris-Benedict standards for older children and the Kestner-Knipping standard for younger children.

A definite relationship between body weight and heat production was demonstrated, and it was found mathematically that "total calories for the weight" gave the closest fit of any method used for predicting calories for the group of girls studied. The application of a correction for age improved the correlation. The standards should also be corrected for different localities but not for racial differences. Considerable evidence is presented to show that there is a relationship between the speed of growth and surplus metabolism, and that the elevation in metabolism seen just before puberty is not due to puberty of itself but to the speed of growth.

A comparison of four current methods of estimating physical status, E. L. Marshall (*Child Devlpmt.*, *8* (*1937*), *No. 1*, *pp. 89–92*).—When four methods of estimating physical status were applied to a group of 77 boys between 7 and 12 yr. of age, the results obtained by the application of the Baldwin-Wood age-height-weight tables and the McCloy age-height-hip-chest-knee-weight standards were similar, while those secured by the Franzen and Palmer ACH Index and the Pryor and Stolz age-hip-height-weight standards were dissimilar. Subjects with a low percentage according to one method were frequently in the normal zone according to another.

A stack of constant volume for respiration experiments with humans, F. G. Benedict (*Jour. Biol. Chem.*, *116* (*1936*), *No. 1*, *pp. 307–320*, *fig. 1*).—An open circuit respiration apparatus is described in which the expired air is collected in an elongated pipe or stack of known and constant value. The basic principle rests upon the stratification of the expired air by controlling the temperature and humidity conditions at the bottom of the stack and its slow rate of diffusion with the outdoor or room air already in the stack due to the difference in densities. The subject breathes through a mouthpiece connected with inspiratory and expiratory valves and as the expired air accumulates in the bottom of the stack it gradually expels the outdoor air from the top. After 10 min. the stack is made into a closed circuit system and the air inside is thoroughly mixed before a sample is withdrawn for gas analysis. The carbon dioxide production and the oxygen consumption of the subject are calculated. The apparatus functions accurately to within the slight error inherent in gas analysis by the Haldane method.

Protein, salt, and fluid consumption of 1,000 residents of New York, B. I. Ashe and H. O. Mosenthal (*Jour. Amer. Med. Assoc.*, *108* (*1937*), *No. 14*, *pp. 1160–1163*).—The determination of the amount of protein, salt, and fluid intake was based on the nitrogen, sodium chloride, and total fluid output in the 24-hr. urine. An allowance of 10 percent was made for nitrogen loss in the feces. The majority of the 1,000 individuals studied took a low protein, moderately high salt, and moderate fluid ration. Only 7 percent of the group ate 75 g or more of protein, while 61 percent ate 42 g or less, 53 percent took over 8 g of salt and 5 percent took 4 g or less, and 39 percent had a fluid intake of 1,500 cc, while 25 percent took 1,000 cc or less daily. "While the normal individual eating a low protein diet tends to have a low blood pressure and a low hemoglobin percentage, the normal person eating a high protein diet has no increased blood pressure and his hemoglobin is normal. The

high protein diet has less effect in raising the blood urea nitrogen than has a low fluid intake."

Observations on human subject subsisting six months on a diet extremely low in fat, W. R. BROWN, A. E. HANSEN, I. MCQUARRIE, and G. O. BURR (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 3, pp. 281–283*).—Observations were made on a normal adult maintained for 6 mo. on a diet consisting of skim milk, sucrose, potato starch, baking powder, sodium chloride, and orange juice, with vitamin and mineral supplements and containing about 2 g of fat. The level of cholesterol or total fatty acids was unchanged, but the iodine number of the serum fatty acids fell approximately one-third and the arachidonic and linoleic acids of the serum decreased, the hemoglobin and red blood cells remained essentially the same, a definite tendency to leucopenia was noted, and the fasting blood sugar level, the glucose tolerance curve, and the urine remained normal. After about 4 mo. the average blood pressure reading was approximately 10 mm of mercury lower. The weight gradually decreased during the first 3 mo. on the low fat diet. No definite trend in metabolic rates was noted, but higher respiratory quotients were found at the end of the 6-mo. period. The physical condition remained unchanged, the amount of fatigue decreased, and migraine attacks previously occurring ceased after 6 weeks.

Water intake and the blood sugar level, M. C. HRUBETZ (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 3, pp. 420–422, fig. 1*).—Observations were made to determine the influence, if any, of the water consumption by the open jar and the tubulated bottle upon the blood sugar level of 30 rats representing the fourth, fifth, and sixth generations, which had been kept continuously on a high carbohydrate diet, and on normal control animals.

Blood sugar levels, which were high during the period when the water was supplied in tubulated bottles, promptly dropped to a lower level in the control animals when the bottles were replaced by open water jars. The high carbohydrate rats maintained the high blood sugar for 3 weeks and returned to normal during the fourth week. Although no explanation of the mechanism involved is advanced, the findings are deemed of importance in the standardization of experimental equipment.

Symptomatology and pathology of potassium and magnesium deficiencies in the rat, G. A. SCHRADER, C. O. PRICKETT, and W. D. SALMON (*Jour. Nutr., 14 (1937), No. 1, pp. 85–109, figs. 8*).—In this study at the Alabama Experiment Station a basal ration of ground yellow corn, wheat middlings, and casein, each extracted as described, and cod-liver oil (59 : 25 : 12 : 1) was employed. One experimental group of rats received a salt supplement of sodium chloride, calcium carbonate, tricalcium phosphate, and trihydrated magnesium sulfate (1 : 1 : 1 : 0.5) and the other a supplement of calcium carbonate, tricalcium phosphate, potassium chloride, and sodium bicarbonate (1 : 1 : 1 : 1.4). A negative control lot received neither potassium nor magnesium supplement, and positive control lots received both potassium and magnesium either as simple salts or as parts of a complex salt mixture.

The rats on the potassium-deficient magnesium-sufficient diet showed slow loss in weight, this loss being of about the same order as in that of the negative controls. These animals were characterized by short furlike hair, cyanosis, abdominal distention, and lethargy resulting in coma, with death occurring on the average at 23 days. Pathological changes were noted in the intestines, pancreas, kidneys, and heart, and a marked accumulation of serous fluid occurred usually in the abdominal cavity, and occasionally in the hydrothorax and hypopericardium. The rats on the magnesium-deficient potassium-suf-

ficient diet made very subnormal growth during the early stages and later lost weight before death occurred. Skin disorders characterized by general hyperemia followed by circumscribed areas of erythema, hemorrhages, eschar formation, and exfoliation consistently developed. Edema of the extremities and nasal region occasionally occurred. A hyperirritability of progressive intensity developed, leading to convulsions (average 30 days) and death (average 35 days). Little histopathology was encountered, although about one-third of the cases showed degenerative changes in the liver. The negative control rats showed symptoms similar to those on the potassium-deficient diet and in addition developed the hyperirritability of magnesium deficiency. Positive controls appeared normal except that growth was somewhat subnormal.

Dark adaptation and vitamin A.—A new photometric technic, P. C. Jeans, E. Blanchard, and Z. Zentmire (*Jour. Amer. Med. Assoc., 108 (1937), No. 6, pp. 451–458, figs. 10*).—A biophotometer devised from the Birch-Hirschfeld instrument previously described (E. S. R., 71, p. 566) and a technic for its use in the determination of the ability of the human eye to adapt to darkness are presented. Experimental observations made with the new instrument demonstrated that vitamin A deficiency is more frequent than has been generally assumed, and that the biophotometer reveals a higher proportion of moderately subnormal subjects than did the previous instrument.

In a group of 37 school children, 19 percent were subnormal and 5 percent borderline cases of vitamin A deficiency, while of 23 orphanage children 8 showed abnormal test results by the new technic. Observations made on two 11-year-old boys indicate that 3,000 units of vitamin A a day is adequate when the biophotometer test is used as the criterion.

Night blindness due to vitamin A deficiency: A consideration of its importance in traffic problems, H. Jeghers (*New England Jour. Med., 216 (1937), No. 2, pp. 51–56*).—Personal observations on subjects tested for avitaminosis A by a Birch-Hirschfeld photometer and data obtained from the literature are presented to show that night blindness (hemeralopia) due to vitamin A deficiency decreases the efficiency of automobile driving at night and increases the probability of accidents. At present no test for the presence of essential hemeralopia is required for either automobile drivers or aviators.

The use of various rat assay methods in comparing crystalline vitamin B_1 preparations, F. F. Heyroth (*Biochem. Jour., 30 (1936), No. 4, pp. 645–650*).—In continuation of the study of the parallelism between the ultraviolet absorption spectra of vitamin B_1 preparations and their potencies (E. S. R., 69, p. 325), three samples of crystalline vitamin B_1 (Peters' preparation 64:19, oryzanin from yeast, and oryzanin from rice polishings prepared by Ohdake) were tested on rats with nervous symptoms induced by a deficiency of this vitamin. The criteria of potency used were the minimal dose needed to cure, the number of days after a single dose the animals remained free of symptoms, and the number of days after a single dose before the weight increase was lost again.

The three preparations consisted essentially of the same physiologically active material, since practically identical results were obtained as judged by all three criteria. The minimum dose for each preparation was approximately 3γ. The rat day dose was found to be 0.41γ for the Peters preparation, 0.509γ (yeast) and 0.45γ (rice) for the oryzanin preparation of Ohdake. Statistical analysis of the results showed that the standard mean variation, when expressed as a percentage of the mean value and with the abnormal cases omitted, was from 35 to 44 for the day dose method and from 37 to 63 for the weight maintenance method. Therefore, the day dose method gave the more accurate

results. The values found for the day doses were influenced by the length of the curative period. The day doses required to prevent the recurrence of severe symptoms in rats and pigeons were proportional to the mean weights of the animals at the times of injection. The minimum curative dose for the rat was found to be 1.2 times the pigeon day dose and 6.6 times the day dose required for preventing the recurrence of severe symptoms.

The vitamin B_1 content of grain studied in comparison with the international standard for vitamin B_1 [trans. title], V. FAMIANI (*Atti. R. Accad. Naz. Lincei, 6. ser., Rend. Cl. Sci. Fis., Mat., e Nat., 24 (1936), No. 3–4, pp. 88–93*).—Four normal adult pigeons receiving 30 g daily of polished and washed rice were used in the investigation. The effects of adding, in equal doses over a 10-day period, 50, 100, 150, and 200 units, respectively, of the international standard vitamin B_1 were compared with the effects of adding 20, 30, 40, and 50 g, respectively, of Villa Glori grain. The beriberi quotient "Q_b" values were determined.

The addition to the basal diet of 50–100 units of the international standard vitamin B_1 gave Q_b residue values of 0.13–0.22, which were approximately equal to the values of 0.13–0.21 given by the addition of 20–30 g of the grain. It was concluded that 1 g of the grain contained approximately 2.5–3 international units of vitamin B_1. When the supplements were increased the relationship was not as close. The 40-g supplement of grain gave a value of 0.23 as compared with 0.43 when 150 international standard units were administered. When the pigeon received a 50-g supplement of grain, the value was 0.28 as compared with 0.38 for the 200-unit dose of the standard. The amount of vitamin B_1 contained in 5 g of the grain was shown to be the approximate daily dose necessary to keep the pigeon in equilibrium with no loss of vitamin B_1.

Lesions of the nervous system of the rat in vitamin B deficiency, C. DAVISON and L. STONE (*Arch. Path., 23 (1937), No. 2, pp. 207–223, figs. 5*).—Groups of experimental rats were placed on diets totally and subtotally deficient in vitamin B_1 or in vitamins B_1 and B_2, and groups of control rats were fed stock diets or artificial diets containing adequate vitamin rations, or were subjected to total starvation and starvation despite adequate vitamin rations. Clinical and microscopical observations were made on the nervous system.

The rats maintained on the experimental diets partially or wholly deficient in vitamin B_1 or vitamins B_1 and B_2 showed neurological signs such as dragging and paralysis of the extremities, equilibratory disturbances, priapism, convulsions, and tonic retractions of the head. The pathological changes found were disintegration of the myelin sheaths of the peripheral nerves and vacuolation and liquefaction necrosis of the ganglion cells of the mesencephalon, metencephalon, and anterior horns of the spinal cord, with hemorrhages accompanying changes in the ganglion and glia cells of the mesencephalon noted in animals with convulsions. Essentially the same pathological changes, but not as marked, were found in the animals partially or wholly starved, with and without adequate vitamin rations. Because of the rapid death of the starved animals, the clinical manifestations were not identical with those observed in animals suffering from vitamin B deficiency.

Biosynthesis of ascorbic acid, B. C. GUHA *and* B. GHOSH (*Nature [London], 138 (1936), No. 3498, pp. 844, 845*).—It is noted briefly, with confirmatory data, that molecular oxygen is necessary for the in vitro synthesis of ascorbic acid in the liver tissue of the rat on incubation with mannose.

Ascorbic acid in gastric juice, G. A. PETERS and H. E. MARTIN (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 1, pp. 76–78*).—Samples of gastric juice from nine dogs showed a range in vitamin C content from 0.33 to 1.51 mg and an

average value of 0.692 mg per 100 cc. Corresponding values for human gastric juice from 12 hospitalized patients were 0.046–1.04, and 0.397 mg per 100 cc. Analyses of the mucous membranes of different parts of the gastrointestinal tract of two dogs showed the highest concentration of vitamin C to be in the duodenal mucosa, followed by the iliac and colic mucosa and the fundic and pyloric portions of the stomach.

Cataract and ascorbic acid in the guinea-pig eye, S. W. Johnson (*Biochem. Jour., 30 (1936), No. 8, pp. 1430–1437, figs. 4*).—The spectrophotometric method in conjunction with the indophenol titrimetric method was employed in determining the ascorbic acid content of the humors and lenses of the guinea pig, horse, ox, sheep, and pig. Determinations were also made on guinea pigs maintained on a scorbutic diet during the depletion of vitamin C and following the administration of prophylactic doses of ascorbic acid.

The titration method gave values in close agreement with those of the spectrophotometric method for the humors of normal animals and slightly higher values for the lenses. The ascorbic acid content of the humors and lenses became almost equal to zero after the guinea pigs had been on the scorbutic diet for 9 days. The rates of disappearance from the humors and lenses during depletion and reappearance of vitamin C after administration ran parallel with those of the other tissues. No cataract appeared in animals deprived of vitamin C.

An excretory test for vitamin C deficiency and subnutrition, E. P. Ralli, G. J. Friedman, and M. Kaslow (*Soc. Expt. Biol. and Med. Proc., 36 (1937), No. 1, pp. 52–54*).—To determine the feasibility of using less than 24-hr. urines in tests for vitamin C saturation, 12 normal adults on diets adequate in vitamin C, 3 normal adults on diets low in vitamin C, and 13 patients with scurvy were subjected to the following tests:

The vitamin C excretion was determined by the customary titration for a 3-hr. period and the following 21-hr. period before the administration of vitamin C. The next day after the bladder had been emptied an intravenous injection of 100 mg of ascorbic acid was given and the urine again tested during the 3-hr. and 21-hr. periods. The subjects in the first two groups were from 20 to 25 yr. of age, while in the third group 5 of the subjects were under 40 yr., 3 between 40 and 60, and 5 over 60 yr. of age.

In the subjects of the first group the urinary excretion of vitamin C before administration of the test dose ranged from 4.5 to 25 mg in the 3-hr. period and from 31 to 180 mg in the following 21 hr., with averages for the two periods of 12 and 67 mg. In the second group the 3-hr. excretion averaged 2 mg and the 21-hr. excretion 10 mg. In the third group the highest value for the 3-hr. sample was 3.3 mg, and in some cases no vitamin C could be detected either in the 3-hr. or in the 21-hr. sample. Following the test dose, the subjects in the first group excreted an average of more than 40 percent of the injected vitamin within 3 hr., in the second group an average of 11 percent, and in the third group an average of 2.6 percent.

"These observations support the fact that the 3-hr. urinary excretion of vitamin C following an intravenous dose of 100 mg of ascorbic acid will serve as an index of vitamin C deficiency or subnutrition."

The multiple nature of vitamin D, C. E. Bills (In *Cold Spring Harbor Symposia on Quantitative Biology, III. Cold Spring Harbor, N. Y.: Biol. Lab., 1935, vol. 3, pp. 328–340*).—This is a concise chronological review of the development of knowledge of the D vitamins from their first differentiation from vitamin A by McCollum et al. in 1922 to the middle of 1935. A list of literature references and an abstract of a discussion of the paper are included.

Technique of the line test assay for vitamin D, A. L. BACHARACH, E. ALLCHORNE, and H. E. GLYNN (*Biochem. Jour.*, *30* (*1936*), *No. 11*, *pp. 2004–2006*).—The Coward single dose method (E. S. R., 73, p. 720) of feeding vitamin D supplements in the line test was compared with the divided dose method on 12 litters of rats receiving a diet more severely rachitogenic than the Steenbock ration 2965. The divided dose method gave significantly better healing as judged from examination of the femurs instead of the ulnae and radii. There were indications that the male rats under the conditions of the experiment responded slightly better to cure by a given dose than did the females.

Estimation of vitamin D in blood serum, J. WARKANY (*Amer. Jour. Diseases Children*, *52* (*1936*), *No. 4*, *pp. 831–847*, *figs. 2*).—The author describes a series of preliminary studies on rabbits to estimate the vitamin D content of normal and pthological blood serums, together with a number of estimations on normal human serums. The vitamin D content of the serum samples was estimated by determining the amount of serum required to cure rachitic rats.

A change of the vitamin D level of the blood serum following the oral administration of 0.1 cc of viosterol (100,000 U. S. P. units) was demonstrated, the peak of the curve which was reached in 24 hr. being maintained until about the fourth day and then slowly decreased, until after from 4 to 6 weeks the elevation was no longer manifest. "The period between the first and the fourth day, the time of a constant high level, is recommended for the examination of factors that might influence the vitamin D level." Ether anesthesia, starvation, or fever did not influence the vitamin D level, nor were the blood phosphorus, calcium, or phosphatase contents changed when viosterol was administered. Following the administration of 1 cc of viosterol (1,000,000 U. S. P. units), values as high as 54,000 U. S. P. units per 100 cc of blood serum were obtained.

In 48 estimations on human blood serums, values of from 45.9 to 135 U. S. P. units of vitamin D per 100 cc were obtained, with an average value of 90.09.

Comparative investigation on rats and chickens dealing with the identity of the artificial antirachitic vitamin (irradiated ergosterol) and the natural vitamin D of cod liver oil, M. J. L. DOLS (*Vergelijkend onderzoek op ratten en kuikens over de identiteit van het kunstmatige antirachitische vitamine (bestraald ergosterol) en het natuurlijke vitamine D uit kabeljauw-levertraan. Proefschr., Landb. Hoogesch., Wageningen, 1935, pp. [9]+139, pls. 2; Eng. abs., pp. 118–125*).—The basal ration of both rats and chickens contained yellow corn 144 parts, wheat middlings, 60, crude casein 30, dried brewers' yeast 3½, calcium carbonate 10, and common salt 2½ parts. The calcium: phosphorus ratio was approximately 4.2 and the phosphorus content 0.45 percent. Varying amounts of the test oils and concentrates were mixed with the basal ration. The standard tests on albino rats were followed by the main tests with White Leghorn chickens. By means of radiographs and observations on bone deformities of the skeleton, the presence of rickets was determined.

Two percent of cod-liver oil protected the chickens against rickets, while irradiated ergosterol in an amount equivalent to the rat units of vitamin D in 20 percent of cod-liver oil failed to protect. The chickens were protected from rickets during the period of 1–57 days by the administration of 250 international units of vitamin D per 100 g of ration, or approximately 80 units per day per chicken, in the form of cod-liver oil, tunny-liver oil concentrate, or irradiated cholesterol. It is concluded that crystalline irradiated ergosterol differs from the vitamin D present in cod-liver oil, and that the provitamin D in cholesterol, activated antirachitically by ultraviolet irradiation, is not ergosterol. It is

considered that the radiograph is sometimes a more minute criterion than post-mortem examination of the skeleton when determining rickets in chickens.

The present status of vitamin D milk, F. C. Bing et al. (*Jour. Amer. Med. Assoc., 108 (1937), No. 3, pp. 206, 207*).—A summary is presented by the Council on Foods of the American Medical Association of the requirements and allowable claims for vitamin D milks, considered from the nutritive point of view.

No claim or intimation may be allowed that an adequate amount of the vitamin is being supplied to infants for milks containing less than 135 units, but above this figure an enhanced nutritive value may be claimed and it may be stated that the milks usually will prevent clinical rickets when fed to normal infants in the amount of 1½ oz. for each pound of body weight in early infancy and 1½ pt. or more daily in later infancy. With 400 units per quart it may be claimed that the amount of vitamin D is greater than that usually required for the prevention of rickets in normal infants. The bottle caps and labels must declare the unitage of vitamin D in terms of U. S. P. units and the source of the vitamin D unless local governmental regulations prohibit such declaration. The foregoing statements also apply to evaporated milk diluted with an equal volume of water. "In the advertising of vitamin D milk the implication should not be made that the Council favors the use of any vitamin D fortified milk over the prescribing of other forms of vitamin D for infants or recommends the use of vitamin D milk to the exclusion of an additional supply of the vitamin in some other form."

***The ultraviolet component of the sunlight of Portland, Ore., measured* by the acetone-methylene blue method, II,** I. A. Manville (*Amer. Jour. Diseases Children, 53 (1937), No. 1, I, pp. 39–55, figs. 6*).—In continuation of the previous study (E. S. R., 62, p. 592) further observations were made to obtain data for the 2-yr. period ended February 6, 1930. The portion of the daily total of ultraviolet radiation between 10 a. m. and 1 p. m. was also determined.

The daily average of ultraviolet radiation for 1928–29 was 3.36 units and for 1929–30 it increased to 6.2 units, due largely to a 26 percent increase in the amount of sunshine and a 20 percent decrease in the amount of rainfall, while the average daily temperature at noon (54.3° F.) remained the same and the amount of smoke from forest fires was very much less. An average amount of 2.76 units or 44.5 percent of the daily total of ultraviolet radiation was received between 10 a. m. and 1. p. m. With the exception of 2 weeks when the radiation was less than 0.5 unit, the taking of a sun bath of from 1½ to 3 h. during the middle of the day would provide protection against rickets. It is pointed out that, because of the mild noon temperature and the richness in ultraviolet rays of the sunshine at this time of day and because of the necessity of irradiating only a small part of the body at a time and at intervals which may be from 7 to 10 days, it is possible to treat rickets effectively the year around in Portland, Oreg.

The effect of nutrition on the primary teeth, F. F. Tisdall (*Child Devlpmt., 8 (1937), No. 1, pp. 102–104*).—To determine whether lack of vitamin D has any effect on the development of tooth decay, 162 children living in an institution were divided into two groups, and in one group the diet, otherwise adequate, was supplemented by vitamin D. Dental examinations were made at the beginning and end of the 1-yr. experimental period. The group given the diet deficient in vitamin D showed an incidence of dental caries in the deciduous teeth more than double that found in the group receiving the vitamin D supplement. The author recommends the administration of a diet built around milk, meat, eggs, vegetables, and fruit, with added vitamin D and a com-

paratively low sugar content to decrease tooth decay and develop normal healthy teeth.

The avitaminoses, W. H. Eddy and G. Dalldorf (*Baltimore: Williams & Wilkins Co., 1937, pp. IX+338, pls. 29, figs. 3*).—This book is derived from The Vitamine Manual written by the senior author in 1921 (E. S. R., 46, p. 256). It has been enlarged to include pathological and clinical discussions of the vitamin deficiency diseases, descriptions of clinical methods for studying human cases, standard methods for bio-assays, and tables of vitamin values expressed in units per ounce. The vitamins A, B (B_1), C, D, E, and the antipellagric, antidermatitic factors of G (B_2) are listed as established vitamins, while the postulated vitamins are G (B_2)—flavine fraction of the B complex, B_3—heat-labile bird factor, B_4—heat-labile rat factor, B_5—heat-stable bird factor, B_6—curative and preventive of rat pellagra, P P body—human pellagra-preventive factor, vitamin D_2—the second calcifying factor in cod-liver oil, and F—designating a group of fatty acids containing two double bonds believed to be preventive of certain skin lesions.

A new group of alimentary constituents (alitoxins) and their corresponding pathologic effect [trans. title], L. A. Tscherkes (*Jour. Physiol. et Path. Gén., 34 (1936), No. 3, pp. 808–814, figs. 3*).—Symptoms similar to those shown by vitamin B_2 deficiency and pellagra in man were noted in white mice receiving a diet consisting largely of cereal (corn, millet, wheat, rice, and buckwheat) or bran, and milk, yeast, and cod-liver oil. The administration of vitamin B_2 did not cure the disease. Under similar experimental conditions rabbits displayed symptoms of paralysis and convulsions. Autopsies revealed some histological changes, particularly in the liver. The disease was prevented when small amounts of cabbage or sugar beet leaves were added to the diet of the rabbits.

The name "alitoxicosis" was given to the disease, with the presence in the diet of specific constituents, alitoxins, believed to be the cause. One alitoxin has been shown to be the glucoside phaseolunatin contained in a type of bean grown in Asia. The alitoxins are destroyed by hydrochloric acid and some by heat. It is suggested that the normal gastric secretion may inactivate certain alitoxins. There is some evidence that the alitoxic agent is closely linked to the protein albumin and that it is toxic to both vegetable and animal organisms.

TEXTILES AND CLOTHING

Fleece density of sheep: The Wyedesa fleece caliper, R. H. Burns (*Jour. Textile Inst., 28 (1937), No. 4, pp. T113–T128, figs. 3*).—The accuracy of the Wyedesa fleece caliper, as indicated by the variation between quadruplicate samples and by a comparison with contiguous quadruplicate samples, and the accuracy of engineer's calipers and the Wyedesa fleece caliper, as shown by the variation of replicate samples, are reported. Certain phases of the work were done at the Wyoming Experiment Station. The literature on fleece density determination is summarized.

A serviceability test on blankets made from four blends of wool, M. B. Hays, R. E. Elmquist, and J. I. Hardy (*U. S. Dept. Agr., Tech. Bul. 572 (1937), pp. 24, figs. 12*).—In this study, conducted jointly by the Bureaus of Animal Industry and Home Economics, blankets were manufactured from four blends of wool selected from individuals of purebred flocks of Corriedale and Rambouillet sheep as follows: Rambouillet equal parts of fine and one-half blood, Corriedale 2 parts of three-eighths and 1 part of one-fourth blood, Corriedale

1 part three-eighths blood and 2 parts reworked wool, and a fourth lot from 100 percent reworked wool. Extensive records were available on the breeding and production of the sheep, including feeding and climatic conditions under which they were maintained. Service tests were made on 63 of the blankets, and their progressive deterioration was studied by measurements at intervals of the physical and chemical properties.

The four fabrics deteriorated progressively during finishing and with service, and in general the rate was greater for those containing reworked wool. The manufacturing process caused some fiber deterioration, as shown by scale breakage, methylene blue absorption, and by microscopical observations. The fabrics composed of equal parts of fine and one-half blood and of 2 parts three-eighths blood and 1 part one-fourth blood gave approximately the same service, and all the blankets were still serviceable after from 23 to 52 and 19 to 37 launderings, respectively. The rate of deterioration was slightly less for the former fabrics, as determined by air permeability, resistance to abrasion, sulfur, nitrogen, moisture content, and methylene blue absorption. However, judged by breaking and bursting strength, scale breakage, and resistance to bacterial infection, the latter fabrics showed a slightly lower rate of deterioration. The fabrics containing 1 part three-eighths blood and 2 parts reworked wool wore out after 36 launderings and showed less shrinkage and lower warmth protection than did the two previous groups of fabrics. The fabric made of all reworked wool afforded little warmth protection and was worn out after 12 launderings.

Classification of sheets as an aid to consumer buying, M. B. Hayes (*Rayon Textile Mo., 18 (1937), No. 3, pp. 71, 72, fig. 1*).—An analysis of 39 brands of bleached cotton sheets is reported by the U. S. D. A. Bureau of Home Economics. On the basis of fillingwise thread counts, the sheets are divided into five classes: Percale, fine counts or utility percale, heavy weight, medium weight, and light weight muslins. The same groupings resulted when the values for breaking strength, weight, and percentage of sizing were compared. The maximum amount of sizing for each of the five classes was determined to be 1 percent for percales, 2 for fine counts and heavy weight muslins, 6 for medium weight, and 10 for light weight muslins. To enable the consumer to know how sheets on the market compare with the standards for the proposed classification, minimum specifications were set up for the thread count, breaking strength, and weight per square yard.

HOME MANAGEMENT AND EQUIPMENT

[Home management studies of the Rhode Island Station] (*Rhode Island Sta. Rpt. [1936], pp. 32–34*).—Progress reports are given on studies of the kinds and maintenance of floor finishes best suited for household use, of methods by which the housekeeping activities are carried on in the home of the married woman who works full time outside the home, and of homemaking on part-time farms in the State. Data are included on the time spent on different home activities by women carrying on full-time jobs outside the home as compared with data reported in Bulletin 221 (E. S. R., 62, p. 598) and on the adequacy of the diet and extent of home improvements on part-time farms.

A study of quality demands in household buying of food, M. I. Liston (*Vermont Sta. Bul. 415 (1937), pp. 39*).—The study was made of 120 household buyers living in Burlington, Vt., and representing homes of liberal, moderate, and limited income levels. To supplement the information gained by guided and unguided statements of the housewives concerning the characteristics of the products habitually purchased and the methods used to identify foods pos-

sessing the desired qualities, further information was obtained from the owners and managers of the food stores patronized and through actual observations made during the sale of seven commodities. The buyers were questioned concerning their knowledge of official grading and the use of grade labels. Only 17 percent had had any training in food buying. The following are the essential findings:

Butter was purchased by brand name by two-thirds of the housewives, the quality factors usually sought being mild flavor and a medium salt content. Eggs were purchased direct from the producers by two-thirds of the buyers, and only one-sixth bought better eggs for the table than for cooking. Medium colored, well-rounded yolks and thick whites were demanded for table use but not for cooking. Uniformity of size, color and shape, freedom from defects, firmness of texture, and a definite variety were the characteristics noted by examination in the purchase of eating apples, which were commonly bought from producers. Potatoes were generally bought from producers without examination or specification as to desirable characteristics. About three-fourths of the housewives requested their storekeepers to select for them young, broad, and full-breasted turkeys bearing the State green tag of quality. Beef roasts were often ordered by cut, with no specifications other than good fat mottling. Small Valencia oranges were preferred for juice and large navels for serving whole. Most of the housewives examined oranges at the time of purchase to get smooth-skinned fruit, heavy in comparison to size, and free of defects.

Little interest was expressed in the establishment of grades and standards for Vermont-grown food products other than turkeys and maple sirup. However, the general concensus of opinion was that canned goods should be officially graded and labeled accordingly.

A study of efficient kitchen arrangements, G. M. Redfield (*Indiana Sta. Bul. 418 (1937), pp. 29, figs. 14*).—The results of a survey made of 774 rural Indiana kitchens showed that many are inadequately equipped, inefficiently arranged, and vary in size from 6 by 7 ft. to 24 by 24 ft. A kitchen 12 ft. wide by 15 ft. long was selected as a standard and was set up in the laboratory and equipped with a range, refrigerator, sink, kitchen cabinet, serving table, chair, and storage cabinet, and space was allowed for 3 doors and 2 windows. The equipment was rearranged in 28 different ways, and the relative efficiencies of the different arrangements were determined by four tasks—the making of a plain cake and an apple pie and the preparation of a single meal and of a day's meals. A process chart was worked out for each task and varied to fit each arrangement.

In a well-equipped and well-arranged kitchen the housewife should be able to start at the storage center and carry through the meal preparations to the dining table with little retracing of steps or crossing from one work space to another. In a long narrow kitchen the equipment should be arranged around the end of the room, while in a square kitchen an L-shaped arrangement is more efficient. Work surface heights between 32 and 34 in. are satisfactory for the woman of average height. Sufficient light should be available at all work centers. The survey of kitchen storage needs disclosed the fact that storage space must be provided in or near the kitchen for about 450 items of canned goods, 30 kitchen utensils, 100 dishes, 72 pieces of silver, 66 pieces of linen, 15 to 20 bulk items such as cereals, 36 cakes of soap, and 7 brushes and handled cleaning tools. "Since farm homemakers spend an average of 54 hr. a week in homemaking activities, the kitchen should receive more thought and attention when planning the house than any other room."

MISCELLANEOUS

A history of agricultural experimentation and research in the United States, 1607–1925, including a history of the United States Department of Agriculture, A. C. True (*U. S. Dept. Agr., Misc. Pub. 251 (1937), pp. VI+321, pl. 1, figs. 11*).—This monograph has been discussed editorially (E. S. R., 75, p. 737).

Report on the agricultural experiment stations, 1936, J. T. Jardine, W. H. Beal, et al. (*U. S. Dept. Agr., Off. Expt. Stas., Rpt. Agr. Expt. Stas. 1936, pp. 208*).—This report has been noted editorially (E. S. R., 77, p. 433).

University of Alaska Agricultural Experiment Station, College, Alaska, [1935 and 1936: Progress reports], January–December, G. W. Gasser et al. (*Alaska Sta. Buls. 5 [1936], pp. 28, figs. 12; 6 [1937], pp. 39, figs. 13*).—The experimental work reported is for the most part noted elsewhere in this issue.

Science serves Idaho agriculture: The Annual Report of the [Idaho] Agricultural Experiment Station for the year ending December 31, 1936, C. W. Hungerford et al. (*Idaho Sta. Bul. 221 (1937), pp. 58, figs. 13*).—The experimental work not previously reported is for the most part noted elsewhere in this issue. Vitamin studies by E. Woods (pp. 33, 34) are included.

Forty-ninth Annual Report of [Kentucky Station], 1936, I, II, T. P. Cooper et al. (*Kentucky Sta. Rpt. 1936, pts. 1, pp. 63; 2, pp. [3]+196, figs. 63*).—Part 1 includes the report of the director, the experimental work referred to and not previously noted being for the most part abstracted elsewhere in this issue. Part 2 contains reprints of Bulletins 362–367 and Circulars 44 and 45, previously noted.

Annual report of the Massachusetts Agricultural Experiment Station, 1936, F. J. Sievers et al. (*Massachusetts Sta. Bul. 339 (1937), pp. 100*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-ninth Annual Report of the [Michigan Station], 1936, V. R. Gardner (*Michigan Sta. Rpt. 1936, pp. 81–99, 182–201*).—The experimental work reported is reprinted from the biennial report previously noted (E. S. R., 76, p. 733).

Annual Report of [Puerto Rico College Station, 1935], F. A. López Domínguez et al. (*Puerto Rico Col. Sta. Rpt. 1935, pp. 166*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Forty-ninth Annual Report [of Rhode Island Station, 1936], B. E. Gilbert (*Rhode Island Sta. Rpt. [1936], pp. 44*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. Meteorological data (pp. 42, 43) are also included.

Abstracts of Bulletins 523–538, Circulars 77–78, and other publications during 1936, A. D. Jackson (*Texas Sta. Circ. 79 (1937), pp. 34*).—In addition to abstracts of the station's own publications as indicated, this circular contains abstracts of articles contributed by members of the staff for publication elsewhere. For the most part these have been either previously noted or abstracted elsewhere in this issue.

NOTES

California University and Station.—Samuel H. Beckett, associated with the irrigation work of the institution beginning with 1909 and professor of irrigation investigations and practice from 1928 till his retirement in 1935 on account of ill health, died September 17 at the age of 54 years. A native of California, he was graduated in civil engineering from the university in 1909 and received the C. E. degree from Stanford University in 1928. From 1908 to 1914 he was associated with the irrigation investigations of the U. S. Department of Agriculture, and in 1918 he served as first lieutenant of engineers in the U. S. Army.

Connecticut College and Storrs Station.—Leonard A. Salter, Jr., instructor and research assistant in agricultural economics, has resigned to become northeastern regional chief of the Division of Land Economics, U. S. D. A. Bureau of Agricultural Economics. Dr. Dorothea Rudnick has succeeded Dr. Paul R. David, resigned, as research fellow in genetics. Laura Fasano and Margaret L. Cleveland have been appointed research assistants in animal diseases.

Delaware University and Station.—Dr. Paul L. Rice resigned as assistant entomologist September 1 to accept a position as head of the biology department of Alma College.

Florida University and Station.—Dr. F. B. Smith, associate professor and research associate in soils in the Iowa College and Station, has been appointed professor of soils and soil microbiologist. Dr. Edwin A. Ziegler has been appointed professor of forest economics, and P. W. Fraser and James W. Miller, Jr., assistant professors of forestry.

Hawaii University and Station.—John M. Westgate, in charge of the station from 1915 to 1935, and subsequently professor and consultant in tropical agriculture, died September 25 after an illness of several months. Born in Kingston, N. Y., on February 17, 1878, he was graduated from the Kansas College in 1897, received its M. S. degree in 1899, and pursued further graduate study at the University of Chicago from 1901 to 1903. He was assistant botanist from 1897 to 1901 at the Kansas College, assistant agrostologist in the U. S. D. A. Bureau of Plant Industry from 1903 to 1905, and in charge of the Department's alfalfa and clover investigations until 1914.

As head of the station and agronomist, Director Westgate made a notable contribution to the agricultural development of Hawaii, especially along the lines of increased diversification. He also took much interest in the sociological problems of the Territory and did much to promote American ideals among the many young men of oriental parentage with whom he came in contact in station and university work. In these and other ways he exercised a wide influence.

Iowa College and Station.—Dr. Paul Emerson, assistant and associate professor of soils from 1909 to 1932 and subsequently a senior soil scientist in the U. S. D. A. Soil Conservation Service, died in a South Dakota canyon September 20 from the effects of a rattlesnake bite. Born in Wilmington, Del., July 6, 1887, he received from the Delaware University the B. S. and M. S. degrees in 1914 and 1915 and from the Iowa College the Ph. D. degree in 1917. He had also served as soil bacteriologist in the Maryland and Idaho Stations.

Kansas College and Station.—The resignations are noted of Dr. A. C. Fay, professor of bacteriology and dairy bacteriologist, W. B. Balch, associate

professor of horticulture, and Dr. J. F. Knappenberger as instructor in bacteriology and poultry bacteriologist, all to engage in commercial work; Dr. J. P. Scott as professor of animal pathology to accept a position in the University of Pennsylvania; Dr. C. L. Lefebvre as assistant professor of botany and plant pathologist; and Esther Bruner Nelson as assistant professor in clothing and assistant investigator in textiles. They have been succeeded, respectively, by Dr. F. E. Nelson, instructor and assistant in dairy husbandry in the Minnesota University and Station; S. W. Decker, associate in fruit and vegetable marketing in the Illinois Station; Dr. Marvin J. Twiehaus; Dr. W. W. Thompson; Dr. D. B. Creager; and Dr. Hazel M. Fletcher. C. W. Mullen, associate editor of *Oklahoma Farmer-Stockman*, has been appointed assistant to the director and associate professor of agronomy.

Louisiana University.—N. D. Morgan has been appointed to succeed R. E. Wright as assistant horticulturist in the North Louisiana Station, effective January 1, 1938. Under an enlarged program, Dawson M. Johns has been appointed assistant in forage crops at the Northeast Louisiana Station, effective February 1, 1938.

Maine University.—Edson Forbes Hitchings, from 1905 to 1911 State entomologist and then till his resignation in 1917 associate professor of horticulture, died September 8, aged 84 years. He was a graduate of the college in 1875 and received the M. S. degree in 1888.

Minnesota University and Station.—Dr. W. M. Myers has resigned as instructor and assistant in agronomy and plant genetics to become associated with the regional pasture research laboratory at the Pennsylvania College. Dr. G. A. Swanson has been appointed in charge of teaching and research in wildlife and game management.

Missouri Station.—The last session of the legislature appropriated $14,800 for horticultural experiment field work. Fields have been established in southeast Missouri near Campbell and Charleston, in southwest Missouri near Monett, and in central Missouri near Orrick. The purpose of these fields is to assist producers of fruits, vegetables, and truck crops in the solution of their cultural, harvesting, and handling problems in localities where these crops can be and are being grown extensively.

A rapid soil test perfected by the station was used during the past summer on a specially equipped train which made stops in 11 counties. About 1,000 samples of soil were submitted by farmers and tested for available phosphorus, potash, and calcium and the degree of acidity. Tests to ascertain the need of the soil for lime and phosphates and its supply of organic matter are also being made free of charge on samples sent in by residents of the State.

Montana College and Station.—The resignations are noted of Dr. A. H. Walker as assistant animal husbandman to accept a similar position in the Arizona University and Station and Kenneth J. Goering as assistant in chemistry. Effective September 1 Dr. E. J. Wellhausen has been appointed associate agronomist, Stanley B. Speck assistant in chemistry, Theodore I. Hedrick instructor in dairy industry, and Ruth M. Spick assistant in home economics research.

New Mexico College and Station.—K. W. Parker and Dr. K. W. Smith, assistant professors of animal husbandry and assistant animal husbandmen, resigned August 15 and September 1, respectively, and have been succeeded by J. O. Bridges and Dr. J. W. Benner. T. R. Timm, assistant agricultural economist in the station, was transferred August 1 to the position of agricultural economist in the extension division of the college and has been succeeded by R. L. Melcher.

Cornell University and Station.—A farm of 100 acres adjacent to the campus has been purchased to extend the program of the physiological field station on experimentally produced nervous disorders in animals under controlled conditions. A supply of pedigreed pigs, sheep, and other animals will be built up to provide breeds of diverse temperaments, and the behavior of the animals studied from birth to death in an attempt to clarify the understanding of experimental neuroses.

Dr. Peter W. Claassen, professor of biology and entomologist since 1926 and a leading authority on the Plecoptera, died August 16, aged 51 years. A native of Kansas, he received from the University of Kansas the A. B. degree in 1913 and the A. M. degree in 1915, as well as the Ph. D. degree from Cornell in 1918. He served as assistant State entomologist in Kansas from 1913 to 1915, then as instructor in biology in Cornell and assistant professor of entomology in the University of Kansas. He returned to Cornell in 1918 for continuous service thereafter except for a period in 1924–25 as a member of the faculty of Tsing Hua University in Peiping, China.

New York State Station.—L. M. Cooley, associate in research (plant pathology), has resigned to engage in farming in Ohio.

Pennsylvania College.—Edward B. Fitts, professor of dairy husbandry extension since 1922, died September 27, aged 67 years. He was a graduate of the Connecticut College in 1893 and had served as assistant in the Storrs Station and instructor in the college, as well as in the Louisiana Station, and from 1913 to 1922 was professor of dairy husbandry extension in the Oregon College.

Virginia Station.—Dr. L. E. Starr, associate animal pathologist, resigned August 31 to accept a position in the Alabama Polytechnic Institute, and was succeeded on September 20 by Dr. J. W. Scales. Other appointments include Dr. Mildred T. Tate and Gladys T. Stevenson as associate home economists and Mary C. McBryde as assistant in plant pathology, all effective September 1, and C. M. Kincaid as assistant animal husbandman.

Virginia Truck Station.—Dr. Jackson B. Hester, soil technologist, resigned effective September 1. Robert Oliver has been appointed assistant horticulturist.

Washington College and Station.—Otto Johnson has been succeeded by A. M. Neubert as assistant chemist. Dr. Victor Heiman, assistant poultry husbandman, has resigned to carry on research in poultry and dairy feeds in New York, and Evelyn H. Roberts as research specialist in home economics to conduct tests of electrical appliances in Chicago. Recent appointments include R. D. Eichmann as assistant entomologist to work with insect problems of truck and greenhouse crops; Dr. Carl F. Reuss as assistant rural sociologist; Ruth C. Robbins as nutrition chemist; Dr. Leo Campbell as research assistant in plant pathology to work with diseases of sugar beets, vegetable, berry, and seed crops; Laraine E. Dunn as assistant in soils in connection with a State-wide project on fertilizers and problems of greenhouse soils; Wilford Hermann as assistant in farm crops; and Emmett I. Robertson as assistant poultry husbandman.

Wyoming University and Station.—Dr. R. S. Justice, assistant pharmacologist, resigned September 1 to accept a position in the University of Georgia. Alexander Johnston has been appointed assistant wool specialist for research and service work. Edward J. Talbot, instructor in marketing, will devote half time to research in the station as assistant economist.

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